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New York State College of Agriculture at Cornell University

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Agricultural Experiment Station

Established under the Direction
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Ithaca, New York

1919

VOLUME II

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CORNELL RURAL SCHOOL LEAFLET

PUBLISHED BY THE DEPARTMENT OF RURAL EDUCATION, NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY

VOLUME XII ITHACA, NEW YORK, SEPTEMBER, 1918 NUMBER 1

THIS ISSUE IS FOR TEACHERS

SUBJECT MATTER FOR 1918-1919 IN NATURAL HISTORY, AGRICULTURE, AND HOME MAKING, BASED ON THE NEW YORK STATE SYLLABUS FOR ELEMENTARY SCHOOLS

Entered at the post office at Ithaca, New York, as second-class mail matter

Cornell Rural School Leaflet

PUBLISHED BY THE DEPARTMENT OF RURAL EDUCATION OF
THE NEW YORK STATE COLLEGE OF AGRICULTURE AT
CORNELL UNIVERSITY, ITHACA, NEW YORK

ALBERT R. MANN, DEAN OF THE COLLEGE
GEORGE A. WORKS, HEAD OF THE DEPARTMENT

SUPERVISOR AND EDITOR
OF THE LEAFLET

EDWARD M. TUTTLE*

*Resigned on October 1, 1918.

THE WAR'S RECOMPENSE

(The original of this verse was found on the body of an Australian soldier.)

Ye that have faith to look with fearless eyes
  Beyond the tragedy of a world at strife,
And know that out of death and night shall rise
  The dawn of ampler life,
Rejoice, whatever anguish rend the heart,
  That God has given you a priceless dower,
To live in these great times and have your part
   In freedom's crowning hour,
That ye may tell your sons who see the light
  High in the heavens — their heritage to take —
"I saw the powers of darkness put to flight,
  I saw the morning break."

CORNELL RURAL SCHOOL LEAFLET

VOLUME XII ITHACA, NEW YORK, SEPTEMBER, 1918 NUMBER 1

FOREWORD

These are days full of struggle and likewise full of opportunity. The two usually seem to go hand in hand. Educationally, these are great days, for the men and women who must solve the tremendous problems of reconstruction are now being nurtured in our schools. What greater honor could one have bestowed upon him than that of being a teacher at this time. The present-day teacher believes in the triumph of right and charges her pupils with the same spirit, and leads them to ways of truth and service.

More and more the artificial gives way to the real. Whatever is done is tested for its worth, and not all things stand the test. Those things that do stand have in them fundamental principles. The study of nature has always been fascinating because so closely real. The school, especially the rural school, is turning to the great out-of-doors world, to the farms and industries, and to the varied interests of the life outside. Children are in daily contact with these things and from them should come the source materials, it would seem, for most school work.

The material in this leaflet is selected for teachers. It is intended to aid the teacher in her association with children and in her guidance of them by helping in the creation of a background of experience which may make the routine lessons of the day interesting. No subject, I think we would agree, should be taught in a merely formal way from the printed page. There is sufficient material close by to motivate the school subjects, and it is the purpose of this leaflet to help the teacher to find it.

Teachers should not be too greatly concerned with the exactness of organization of nature study material. It is easy to destroy its greatest value through formal organization and set periods. Rather, nature study should abound in all the exercises of the school as content through which many subjects can be made dynamic and genuine.

The New York State College of Agriculture is earnest in its desire to be of service to the schools and is always ready to do all that it can for the boys and girls of the State in cooperation with the State Department of Education. Teachers and children should feel free to consult the members of the staff on subjects of special interest.

SPECIAL ANNOUNCEMENT

Professor R. M. Stewart has been asked to take over the work formerly carried by Professor Tuttle, who resigned to enter the army. Professor Stewart is now preparing a complete index of materials in the leaflet from September, 1907, to the present time. This index will be the second number of the leaflet for this year and will be available for wide distribution. A copy will be sent to each school, provided the district superintendent has turned over to the leaflet office the names of the teachers in the schools, and provided further that the teachers have returned the blank form on the last page of this leaflet properly filled out. This index will make available in workable form all the materials heretofore published in the leaflet. A copy should be in each elementary and rural school of New York State.

PART I

LIST OF SUBJECTS FOR 1918-1919 IN NATURAL HISTORY AND IN ELEMENTARY AGRICULTURE AS OUTLINED IN THE NEW YORK STATE SYLLABUS

BIRDS

For special study, the robin and the hen; to be recognized, any two winter birds and any five of the following: junco, song sparrow, wren, ovenbird, chimney swift, wood thrush, sandpiper, flicker, catbird, guinea fowl.

ANIMALS

For special study, the cow and the earthworm; to be recognized, any four of the following: sheep, weasel, snail, rabbit, deer.

INSECTS

For special study, mosquito or house fly, and one biting and one sucking insect; to be recognized, any four of the following: wasp, cabbage butterfly, lady beetle, cankerworm, horsefly.

The spider is given for recognition. The ways in which it differs from an insect should be learned.

PLANTS

For special study, radish; to be recognized, one of the clovers, one of the grains, one of the grasses, and any six of the following: jack-in-the-pulpit, peach, nasturtium, honeysuckle, vetch, dogtooth violet, laurel, crocus, pumpkin, celery, iris, solomon's-seal; also any four of the following weeds: sour dock, ragweed, beggar-ticks, Canada thistle, clotbur.

TREES

For special study, the elm; to be recognized, two kinds of fruit trees, one conifer, and any four of the following: spruce, pine, juniper, plum, apple, walnut, dogwood, maple, sumac, oak, fir, tulip tree.

BIRD STUDY

THE EDITOR

AS ONE writes there come to ear the liquid warble of a wren, the whistle of a meadowlark, the steady scolding of a phoebe, the ringing call of an indigo bunting, the carol of a robin, and the strange winding song of a veery in the ravine close by. It is hard to imagine what life would be like without these winged comrades. It is still more difficult to think of being unconscious of them and unresponsive to them though they be all about. Yet there are some persons who have grown up without knowing the joy and the resource, not to speak of the great practical service, that come to human beings through the birds. Surely it is for us who teach little children to help them to open eyes and ears and minds to their feathered friends, and to welcome and protect the birds about their schools and homes.

Bird study lends itself to all places and to all seasons. Even in the largest cities there are always some species that can be discovered in addition to the ever-present house sparrow, and experiences show that one never knows what may be discovered when interest is once aroused. As to the proper time to begin, it has no relation to the calendar, but is far more concerned with the occasion of some first-hand experience with bird life that has proved interesting and stimulating.

The teacher need not be an expert student of bird life in order to inspire and conduct bird study successfully in the school, but he or she must be familiar with the various ways of beginning bird study so that there will be first-hand contact with the birds. Among the most familiar and useful methods of approach to the work are the following:

Making a collection of birds' nests
Feeding birds in winter
Building birdhouses
Keeping a bird calendar
Taking field trips to study the birds
Celebrating Bird Day
Forming Junior Audubon classes

The following extracts from letters show how from very simple beginnings bird study grows in scope and interest:

I began teaching here last September, and when I asked the children a few very simple questions about birds, they could not answer them. In fact they knew only two different kinds of birds, the English sparrow and the red-breasted robin. So I decided we would learn a few things about birds.

First we discussed the uses of birds, the good they do for man. The children were surprised to learn that the birds work. In the meantime I had hung in the room several good pictures of birds common around here, and the children learned the sizes and colors and markings until we could compare them easily with the robin and the sparrow.

CROWS AT FEEDING STATION IN MIDWINTER

This spring when the birds migrated, the children were able to recognize twelve or fourteen kinds. We also have a bird calendar in the schoolroom, and the other day a girl fifteen years old, who was entering the name of a bird she had seen for the first time, said, "I didn't know there were so many different kinds of birds in New York State." The bird was the song sparrow, and there are hundreds of them around here.

We have field trips and notice the birds' nests, position, size, and texture, after having studied some birds' nests at school. Of course in the country one finds many boys quite well acquainted with them. When we have our windows open for exercises we listen to the birds. We are learning some of the bird songs so as to tell them quickly. I try to impress the idea on the pupils that most birds and animals have a right to live here and how selfish and unwise it is to take their lives. We have a feeding station and can watch the actions of the birds best there. It also teaches the children to be saving and not throw their crumbs away.

During the winter we place suet on the trees. After the birds come to the trees, we tie the suet to a branch fastened to the window sill. For a number of winters downy woodpeckers, chickadees, nuthatches, and hairy woodpeckers have come. This winter we added to the list the brown creeper. The blue jays come to the trees but

we have never seen them come to the window. Whenever the birds come, we go quietly and watch them. They grow quite used to this and will stay for a number of minutes. One day during the noon hour, the children were delighted when a brown creeper lighted on one boy's head. A number of birdhouses have been put up. Some were built by the children themselves, others by friends or older members of the family. The children thus far have preferred to place the birdboxes near their homes. They tell each other about their tenants and so the interest grows. One boy is now telling us about a robin that is building its nest in his woodshed. Several birds found dead have been brought in from time to time: bluebird, grackle, sapsucker, veery, chickadee, English sparrow, and two red-winged blackbirds. This has given us a chance to study the markings of these birds in detail. This spring two boys brought in a meadowlark which they had seen wounded by a hawk. They had tried to save the bird's life, but it had died in spite of their efforts. We keep a bird calendar and now (April 10) have fifteen spring birds which the children have seen. We go on field trips during the autumn and spring but have never taken any winter trips. We have a Junior Audubon society and color the pictures. This helps in identification.

As we knew so few birds in the beginning we found we had plenty to do to identify those we saw. This led to our keeping a bird calendar. The first spring we identified thirty birds — not many, but thirty more than most knew the fall before. Now we can correctly identify many more. As helps, we used the outline pictures of birds with the directions for coloring (Audubon pictures). The children enjoyed the work and it helped immensely to identify the birds.

The boys built birdhouses and although the birds did not like the first ones especially well, we have improved and have learned some interesting things about birds. We learned that sparrows are very jealous birds and are always interfering with the other birds' house building. If some bluebirds thought that they were safely located in a house, Mr. and Mrs. Sparrow were quite apt to descend on that particular house and out would go all the bluebirds' furnishings. One day after the sparrows were permanently located, two strange birds were seen to go fearlessly into the house. The female stayed and the male mounted guard outside. The sparrows scolded, but the birds stayed for a while then quietly went away. This was repeated for several days, when one day we discovered a different colored egg in the nest, and after searching in our bird book we found that the birds were cowbirds and that they never built nests of their own. All this led us to a more careful study of the habits of the different birds, especially to distinguish their different songs and calls. Now our field trips are full of sounds as well as sights. We have learned to study the birds and refer to a picture instead of learning the picture and going out to see if we could find a bird to fit the picture. Perhaps we should have known we were beginning wrong in the first place, but we know our lives are much richer than if we had never begun at all.

We have formed a custom of reporting every morning what birds have been seen since the previous morning. One morning this spring we had seventy-one birds reported.

One April morning after a heavy fall of snow, our feeding station was nearly covered, and while we were singing our morning songs, one pupil called my attention to a little song sparrow sitting on the snow in front of the opening. In a second he disappeared and as suddenly reappeared with a piece of bread which he had found in the station. We were glad that the day before we had shared our luncheon so that the poor little fellow might have something that cold snowy morning.

We have a fine collection of birds' nests in the school, so that the children can tell the nests of all of our common birds. I have an eight-year-old boy who brought over thirty birds' nests that he and his grandpa, a man over eighty years old, had collected around the farm one Saturday. That shows that the people at home, as well as the boys and girls, are interested in nature study. The children collected birds' nests until the weather made it impossible for them to go in the woods. We sent one of our nests, mounted, to Cornell for Farmers' Week this year.

In addition to knowing various ways by which children may be interested in bird study, teachers should know the simple standards that apply to the description of a bird for the purpose of identification, to the description of a nest for the purpose of identification, to the proper establishment and maintenance of feeding stations, to the observations that should be recorded on a bird calendar, and to the construction of bird-houses. These matters are discussed more fully in the following paragraphs.

IDENTIFICATION

Children are constantly seeing new birds, and very often come to school with the most impossible descriptions, making it quite out of the question to determine what bird it was that they saw. It is sometimes difficult to distinguish the markings on a bird, especially if it is seen against a strong light, and it requires patience and practice to enable one to obtain a description of a bird seen for the first time that will make possible its identification. Yet this is one of the fundamental considerations in bird study and should be thoroughly understood and constantly strengthened. The points on which the identification of a bird is based in the order of their importance are as follows:

1. The size as compared with the three standard types: the English sparrow, the robin, and the crow.
2. The general color above and below.
3. Any specific color markings that are noted, such as the red patch on the head of the male woodpeckers or the black bib of the chickadee.
4. When and where the bird was seen. In the case of some of the sparrows, for example, it aids greatly in determining the species to know whether the bird was seen in the open fields or in shrubbery.
5. The kind and the color of the bill and the feet, if it is possible to see them. A striking example of a characteristic bill has been found in the description of the grosbeaks, which have been unusually numerous during the past few winters.
6. Any peculiarity of flight or action. Examples of this are the bounding flight of the goldfinch and the way in which the phoebe bobs its tail.
7. The song. Many bird songs can be imitated more or less closely with practice, and they are exceedingly characteristic.
8. If the nest and eggs are discovered with the bird, these also are of service in establishing the identity of the species.

When a bird description is brought to the school there are several ways by which it may be possible to identify the bird. Every school should have the folio of bird plates furnished by the State Department of Education in 1915. These are very valuable from a pictorial point of view.

A question that has troubled many teachers is that of preserving these plates in good condition and still permitting their free use. We should all appreciate having suggestions from any teacher who has successfully solved this problem.

A good bird book, of course, is the most authoritative method of identification, for it gives a complete, detailed description, and it sometimes happens that two species are very much alike except for slight characteristics. Every year more and more schools are adding bird books to their libraries, and if the school does not have any book on birds, it would be desirable to recommend in the next list for purchase some such book as Chapman's *Handbook of Birds of Eastern North America*, Reed's *Bird Guide*, Dugmore's *Bird Homes*, or any other work that is standard.

There are often persons in the community who have considerable knowledge of bird life, and they are always glad to be of assistance to the school. It often happens that when other means have failed such a person has been able to identify the bird that is under discussion. It is always wise in any subject to use the community as far as possible, for it strengthens the bond between the school and the home.

As a last resort the bird description may be sent to the College of Agriculture, and, if it is at all complete, an accurate identification can easily be made.

COLLECTION OF NESTS

With very few exceptions birds build new nests each year, and there is no harm in appropriating the old ones. This work is most often done in the autumn when the leaves have fallen from the trees and revealed the birds' nests. It is often exceedingly difficult, however, to make sure of the identity of a nest if it is then seen for the first time. Yet many nests are fairly characteristic.

In observing a bird's nest there are certain definite things to look for just as in observing the birds themselves. According to Dr. Allen, the following points should always be considered:

Location:

a. General environment — woods, hedgerows, orchard, and the like.
b. Name of tree or bush in which nest is placed.
c. Location in tree or bush, as end of branch, in a fork, near trunk, and the like.
d. Height above ground.

General shape and size:

a. Diameter, inside and outside.
b. Depth, inside and outside.

Material:
- a. Outside.
- b. Inside (lining).-
- c. In some nests, such as the robin's, there is a middle layer; this, also, should be described.

Of course, the most satisfactory nest study results when in the spring and summer the boys and girls locate the nests as the birds build and occupy them, and are thus able accurately to identify the nest from the bird. Caution should always be exercised in approaching and observing birds at the nest, because they are rather easily disturbed at the nesting period, and may often be caused to desert the nest. It is very valuable likewise to know how many birds are nesting in a given locality, and how successful they are in rearing their young. Such a study is likely to reveal the enemies that birds have to struggle with and may teach many valuable lessons in this connection.

A good way to preserve nests is to mount each one on a neat sheet of cardboard, and to include with it a drawing or a picture of the bird and a short composition or story of its characteristics and habits.

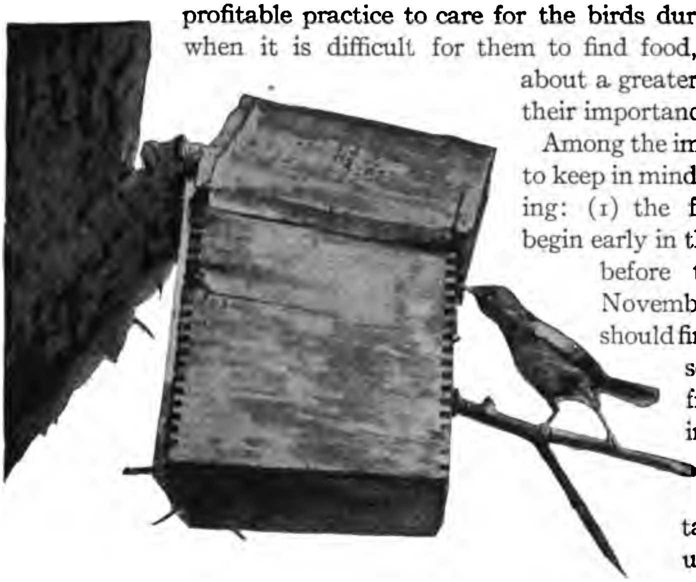
WINTER FEEDING

There are several reasons why feeding the birds in winter is one of the most satisfactory methods of bird study. In the first place there are fewer species present in the winter, and it is easier to identify all those that come to the feeding station. In the second place, feeding the birds

A CHICKADEE HAVING AN ACCEPTABLE MEAL

offers an excellent opportunity for first-hand contact and study, and it is no exaggeration to say that the child who has been so fortunate as to have a wild bird eat from his hand has had his whole attitude and outlook to life changed. Last, but by no means least, it is a praiseworthy and profitable practice to care for the birds during the season when it is difficult for them to find food, and it brings about a greater realization of their importance and value.

Among the important points to keep in mind are the following: (1) the feeding should begin early in the fall, at least before the middle of November; (2) the food should first be placed at some distance from the building, and after the birds find it, the distance can gradually be lessened (3) the food should be supplied regularly, neglect for even a few days will cause the birds to seek elsewhere; (4) there should be a shelter of brush or evergreen boughs somewhere within thirty feet of the feeding station into which the birds can go when alarmed; (5) the best foods for the seed-eating birds are cracked corn, buckwheat, hemp, millet, sunflower seed, or, best of all, a mixed chick food. These should be placed on a feeding shelf. Insect-eating birds will eat sunflower seeds and crumbs of raw peanuts from the shelf, or beef suet fastened in a tree.



"I WONDER WHETHER THIS WAS MEANT FOR ME?"
A house wren inspecting a nest box to see whether it is correctly built

BIRDHOUSES

Any person who has had the experience of watching a pair of birds nest in a house that he has built, will understand the advisability of bringing a similar experience into the lives of boys and girls. The lessons that result in increasing the knowledge and building the character, are immeasurable.

The principles of birdhouse construction are coming to be better understood each year. The essential things to remember are: (1) The house should not be too large, and, with the exception of a house for purple

martins, should have only one compartment and only one hole. (2) The hole should be placed above the center of one side of the house, so that the bird may enter and go down to the nest. (3) The hole should not be too large: one inch in diameter for wrens and chickadees; one and one-half inches for bluebirds and swallows; two and one-half inches for flickers. (4) The material used should be hollow limbs, slabs of bark, or old gray weathered wood. New wood or bright colors should be avoided.

The best place for the box is on a pole eight to twelve feet from the ground in an open space or at the edge of trees facing the open. A post on the porch or on the unshaded side of the house will also serve if the box is made to face out. House wrens and nuthatches are the exceptions that will sometimes use boxes placed in dense shade. The trunk of a large tree, a telegraph pole, or a high fence post will prove satisfactory, although perhaps not quite so much so as the separate post. An excellent place for the large flicker or sparrow hawk box is the top of the stub of a tree the upper branches of which have died and been cut away.

BIRD CALENDAR

Many teachers have found the keeping of a bird calendar one of the most interesting and profitable ways of stimulating bird study and observation, beginning early in the spring with those species that have been winter residents, and adding each new species as it returns from the South. There are schools that have, in the course of the season, been able to recognize more than one hundred different kinds of birds. Even though teachers and pupils are familiar with only a very few species at the beginning of the season, there is no reason why a calendar may not be kept with the result that in any given year a great many new birds will be seen. Of course as the list grows larger and larger, it is more difficult to find new species to add, but the zest and the enthusiasm become all the greater, and there are some schools that have reached the point where they are able to go into the more intensive and difficult study of the sparrows, warblers, and some other families.

In discussing bird calendars Dr. Allen has the following to say:

> Inaccurate observation is worse than no observation, for great harm can come from it. Great care should be exercised by teachers, therefore, to verify the reports brought in by children so that no mistaken observations will appear on the chart. If there is any doubt as to the accuracy of a record, it should not be credited; while this may give momentary disappointment to some child, it will be excellent training for him and will inspire all the others to observe more carefully. They will thus come to appreciate the chart more and more. If an atmosphere of accuracy is created about the school calendar, the study of the sciences later on will not be the bugbear that it is to some children.
>
> In order to verify the first record, it is well to keep the second record, so that if too great discrepancy occurs between the first record and the

average date of arrival, the second date can be retained instead. The migration table on page 20 will be a guide to accuracy. Birds may arrive much later than the average date given, but rarely more than a week earlier.

The calendar should have at least five columns: the first for the name of the bird, the second for the date, the third for the locality where it was seen, the fourth for the name of the discoverer, and the last for the date of the second arrival.

A space devoted to recording the date the bird is last seen each year, might stimulate a little interest in the fall migration of birds, which usually passes unnoticed.

Often children make most artistic calendars. One way is to put the record in the center of a large sheet, leaving wide margins which are filled with water color or crayon drawings of the birds seen. Another way is to make a booklet, using one sheet for the drawing, the record, and perhaps a brief description or bit of literature concerning each bird.

FIELD TRIPS

Many communities have reached the place where they recognize the value of taking the school on field trips. There should always be some definite object in mind, even though the senses are alive to all the experiences revealed on a trip. One of the most interesting kinds of field trips relates to bird study. Of course one who is familiar with bird life realizes that the most satisfactory times for studying birds in the field are the early morning and the early evening. There are many teachers who have reached the point with the children where it has been possible to go on trips at one or the other of these times. The lessons that come to the children from such an experience are numberless, in addition to the unfamiliar birds that they will discover and to the new observations which they will make upon those they already know. The essentials of bird study are quietness, patience, and control. Ideally, of course, a person should study birds alone; but there is no reason why several may not go together with good results, and very often, if the attitude is right, a larger party may discover many kinds of birds in the course of a field trip. The teacher will find that such an experience will serve as few other things can to create a bond of sympathy with the children, and, rightly used, it may prove an incentive and stimulus to better work in all directions.

The study of birds in the field may well be connected with their economic value. It is sometimes necessary in order to obtain the cooperation and sympathy of the community, particularly of the men, to show that the activities of the school have a practical value; and while bird study is desirable from its æsthetic side, it nevertheless has very practical value because of the service that birds render in the control of insect and weed

pests and rodents. Whenever possible, it would be well to emphasize the importance of this service and to study the food habits of individual species.

BIRD DAY

For some years past the State Department of Education has designated some Friday in April of each year as Bird Day, and many schools have held interesting and profitable celebrations. It should serve as an opportunity to demonstrate to the community the work of the school, and the worth while character of bird study. It should in all senses of the word be an occasion when the work is summarized, when the school takes account of what it has accomplished in bird study through the year, and makes plans for the future.

JUNIOR AUDUBON CLASSES

The recognized association for the promotion of bird study and the protection of bird life is the National Association of Audubon Societies, with headquarters at 1974 Broadway, New York City, in charge of T. Gilbert Pearson, Secretary. This association stimulates, as a part of its activities, the formation of Junior Audubon classes in schools and among groups of interested young folk. Hundreds of schools in the State have become affiliated with the Audubon association, and it is one of the most helpful things that can be done. The local classes may be organized as a club, and children are always interested in such an enterprise.

THE USE OF LITERATURE AND SONGS

Literature and music are full of response to bird life, and the teacher would do well to bring the children in contact with these other resources through a common interest. The bird quotations given on page 49 will be helpful in this connection. The bobolink's song, which was published in one of the leaflets for children two years ago, proved of great interest. It is even possible that in the realm of simple dramatization bird study may be a contributing factor; in fact in one school the children took great delight in representing different species of birds for the others to identify.

REFERENCES

In previous leaflets many of the phases of bird study have been fully discussed. The following references will be helpful.

How to attract wild birds, September, 1914, page 12
How to attract wild birds, September, 1915, page 16
The food of birds, September, 1914, page 18
Birds' nests, September, 1916, page 44
Birdhouses, September, 1916, page 51
The migration of birds, September, 1917, page 41

THE AVERAGE DATE OF THE SPRING ARRIVAL OF BIRDS AT ITHACA, NEW YORK

February 1 to 21

Prairie horned lark

February 22 to March 15

Robin
Bluebird
Song sparrow
Canada goose
Red-winged blackbird
Bronzed grackle

March 16 to 25

Meadowlark
Killdeer
Black duck
Bufflehead
Baldpate
Pintail
Mallard
Wood duck
Phoebe
Cowbird
Cedar waxwing
Rusty blackbird
Slate-colored junco
Fox sparrow
Hooded merganser
Mourning dove
Ring-billed gull

March 26 to 31

Golden-crowned kinglet
Purple finch
Sparrow hawk
Savanna sparrow
Vesper sparrow
Cooper's hawk
Sharp-shinned hawk
Marsh hawk
Pied-billed grebe
Belted kingfisher
Great blue heron

April 1 to 5

Coot
Field sparrow
Chipping sparrow
Green-winged teal
Woodcock
Flicker
Yellow-bellied sapsucker
Swamp sparrow
Lesser scaup duck

April 6 to 10

Tree swallow
Blue-winged teal
Pectoral sandpiper
Pipit
Winter wren
Osprey
Bittern

April 11 to 15

Wilson's snipe
Red-breasted merganser
Hermit thrush

April 16 to 20

Goldfinch
Ruby-crowned kinglet
Louisiana water-thrush
Barn swallow
Horned grebe
White-throated sparrow
Pine warbler

April 21 to 25

Myrtle warbler
Towhee
Spotted sandpiper
Chimney swift
Virginia rail
Bank swallow
Broad-winged hawk
Green heron

April 26 to 30

Rough-winged swallow
House wren
Brown thrasher
Blue-headed vireo
Black and white warbler
Yellow warbler
Veery

Solitary sandpiper
Black-throated green warbler
Florida gallinule
Bonaparte's gull
Water-thrush
Whippoorwill
Sora
Pine siskin

May 1 to 5

Redstart
Least flycatcher
Long-billed marsh wren
Lesser yellowlegs
Bartramian sandpiper
Parula warbler
Catbird
Grasshopper sparrow
Black-crowned night heron
Warbling vireo
Yellow-throated vireo
Nashville warbler
Maryland yellowthroat
Palm warbler
Ovenbird
Black-throated blue warbler
Blackburnian warbler
Baltimore oriole
White-crowned sparrow
Magnolia warbler
Crested flycatcher
Bobolink
Wood thrush
Scarlet tanager
Kingbird
Rose-breasted grosbeak
Red-headed woodpecker
Red-breasted nuthatch

May 6 to 10

Chestnut-sided warbler
Worm-eating warbler
Red-eyed vireo
Olive-backed thrush
Canadian warbler
Least bittern
Greater yellowlegs
Purple martin
Ruby-throated humming bird

May 11 to 15

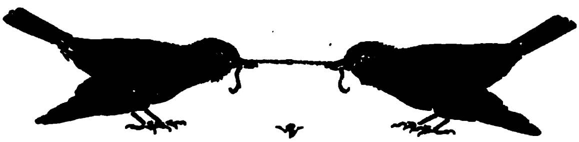
Mourning warbler
Wood pewee
Indigo bunting
Cape May warbler
Hooded warbler
Bay-breasted warbler
Cerulean warbler
Yellow-breasted chat
Philadelphia vireo
Wilson's warbler
Lincoln's sparrow
Tennessee warbler
Orange-crowned warbler
Black-billed cuckoo
Yellow-billed cuckoo
Black tern

May 16 to 20

Orchard oriole
Alder flycatcher
Common tern
Least sandpiper
Red-backed sandpiper
Semipalmated sandpiper
Turnstone
Semipalmated plover
Nighthawk
Blackpoll warbler
Gray-cheeked thrush

May 21 to 30

White-eyed vireo
Yellow-bellied flycatcher
Black-bellied plover
Prothonotary warbler



ROBIN

(For special study)

A. A. Allen
Assistant Professor of Ornithology

Icy drifts still fill the shaded fence rows, and the chill north wind still speaks of snow and winter. Three times the ice has stilled the noisy frogs, three times the whitened marsh has shown brown by noon, and now by the laws of the sages spring should be here. A peeper chirps in a neighboring pond; a chickadee gives his *phoebe* note; a nuthatch rolls his springtime call; and there in the orchard on a topmost branch appears the robin. " Good luck," they say, " to see him first on highest branch." Good luck to see him anywhere! Never so rich am I as after seeing the first robin; then home with the glad tidings! " The robin has come and spring is here!" Watch him as he flies to the sun-warmed spot where perchance an early worm may be found. How brilliant is his chestnut breast, how green the grass, how soft the air! We overlook the stubborn drifts, we forget the icy crystals fringing yonder pond. All is changed, and the robin has changed it.

Through the long winter he has been with flocks of his fellows in the sunny southland, feeding on berries of mistletoe and holly, and now he is back once more with an appetite for grubs and worms. Occasionally he passes the winter in our chill northland, if he can find a sheltered spot with berries of cedar, grape, or mountain ash; but usually he leaves us in October for the land of plenty. With the first signs of spring, however, back he flies, the harbinger of all the wealth to come. Were he less common, he would no doubt be thought by all a kingly bird, the pride of the whole thrush family. Let him hide in distant forests and reveal himself to a lucky few only, and there would be no bird that could excel his beauty, his dignity, or his song. Unfortunately for his reputation, but happily for mankind, he is one of our most abundant birds and is most content about our dooryards. He and Chanticleer announce the day. " Cheer up, cheer up, cheerily, cheerily, cheerily," he sings; and one wakes with a smile. How much easier to start the day right when this is our morning summons!

The male robins come first in the spring and await the arrival of their mates. Often they do not sing for many days, or even weeks, after arriving, but when the females come in late March or early April they commence their morning and evening choruses. Unlike many brightly colored birds, the males and the females are often alike in coloration, the duller colors of some being due more to youth than to sex.

After mating takes place, both birds join in building the nest, which is placed in a crotch on a horizontal limb or on some projecting ledge

about our dwellings. Often the site is retained year after year. The nest is a rather bulky structure, but a marvel of symmetry in the plasterer's art. An outer layer of straw, rags, and paper is neatly hollowed and filled with wet mud. Bill, feet, and breast are used until a perfect bowl is formed. This is lined with finer grasses until the home is complete. Three to five blue eggs are laid, which both birds take turns in incubating.

Like the young of all our song birds, the robins when first hatched are naked and blind, and it is two weeks before they are fully feathered and able to leave the nest. At this time they differ somewhat in color from their parents, for their breasts are much paler and are covered with large, round, dark spots. In this plumage they are more like other thrushes and show their family characteristics much more plainly than when fully grown.

ROBIN
About one-sixth natural size

After the young are able to care for themselves, the parent birds usually start a second brood. It is now that they begin to gain a rather unfortunate reputation because of their fondness for fruit. It has been found, however, that by planting mulberries or some of the native fruits it is often possible to attract the robins from cultivated cherries and berries, and thus protect the fruit in a way that is more satisfactory than by killing the birds. It is doubtless true, however, that in some fruit districts where the natural food supply has been replaced by the much more dependable cultivated fruits, the robins have increased unduly and now do considerable damage; but killing should never be resorted to until competent scientific investigation has been made.

When the robins first come back in the spring, they are often surprised by late snowstorms. At such times many of them perish unless they can find dried fruits and berries still clinging to the bushes and trees. Virginia creeper, wild grape, mountain ash, barberry, and sumac save the lives of many robins and bluebirds also, for these plants retain their fruits all through the winter and far into the spring. On Bird Day or Arbor Day school children should plant some of these fruit-bearing shrubs, vines, or

trees, for by so doing they will save the lives of early migatory birds for years to come.

SUGGESTIONS FOR STUDY

The robin is one of the birds used as a standard for comparing the size of other birds when they are observed in the field. It is about ten inches long. Pupils should watch robins until they carry in mind a picture of how large a robin is, so that they can say on seeing some bird that approaches a robin in size that it is larger than, or smaller than, or about the size of a robin.

The following questions should be answered by the children from actual observations, and not from books. Set them watching the robins in the spring and reporting daily.

1. Who will report the first robin in the spring? The second?

2. How long will it be after the first one has been reported before every pupil has seen a robin?

3. What do the robins do during the first few weeks after they come? Can they be attracted by food put out for them, especially during stormy weather?

4. Who will discover when and where a pair of robins is building a nest? How long does it take to complete the nest? How is it constructed?

5. When does the mother bird begin to sit on the eggs? How long before they are hatched?

6. What kind of food do the parents bring to the young birds? How many trips will they make to the nest with food in an hour? Are they busier at some times of day than at others? Try to calculate how much food it takes to raise the family.

7. How long after the young birds are hatched before the first flying lesson? How do the parents teach the young birds to fly? How long is it from the time the young birds leave the nest until they can fly off the ground into a bush or tree and hence out of danger? How do the young birds differ from their parents?

8. Do robins have a second brood? In the same nest? What time of year does this happen? Is the process of raising the second family just like that for the first?

9. See how many different colors can be found on the robin by observing closely.

10. How many songs or notes has the robin? Do different calls mean different things?

11. Does the robin run or hop? Watch it on a lawn. How does it know where the angle worms are?

12. Is the robin a useful bird? Each pupil may write a story of what he has learned by watching the robin.

BIRDS TO BE RECOGNIZED IN 1918-1919

A. A. Allen
Assistant Professor of Ornithology

WINTER BIRDS

There is perhaps no more auspicious time to begin the study of birds than during the winter months when so much of nature lies dormant. The number of species is smaller and less confusing, the birds themselves

PHOTOGRAPH BY A. A. ALLEN

FEEDING WILD DUCKS IN WINTER WHEN THEIR NATURAL FOOD IS SCARCE

are more conspicuous because of the absence of foliage, and many species are easily attracted to the windows where an intimate acquaintance with them can be gained.

For reference there follows a list of all the birds that may be seen in New York State during the winter, with an indication as to which are the more common, and which are less likely to be seen. Some species are permanent residents (p. r.) in the State and are found throughout the year; some are only winter visitants (w. v.), spending the winter months but leaving in the spring to nest farther north. Occasionally when food is unusually abundant or for some other reason, some of the summer residents or fall migrants, such as the robin, the bluebird, the blackbirds, the kingfisher,

the white-throated sparrow, the chipping sparrow, the field sparrow, and others, remain all winter. One winter, for example, a Maryland yellow-throat stayed at Ithaca and was seen during the coldest weather of January, but this might not happen again in fifty years; therefore only the regular winter birds are listed in this discussion.

For convenience they are divided into land birds and water birds, the latter being found only about the Great Lakes, the Niagara River, the Central Lakes, New York Harbor, and Long Island Sound, or wherever the water regularly remains unfrozen. The ten most common winter water birds and those most likely to be seen are as follows:

Herring gull. The only common "sea gull." Immature birds are brownish gray with black tails; adults pure white with pearl-gray backs.

Horned grebe. A duck-like bird with pointed bill. Silvery white below and gray above, with conspicuous white cheeks in the winter plumage.

Black duck. Uniform brownish black plumage, silvery white under the wings, a dark blue spot in each wing.

Scaup duck (bluebill or broadbill). Head, neck, and breast black with green reflections on the head, back narrowly barred black and white, sides white.

Canvasback. Head and neck reddish brown, breast black, back white with narrow black lines not visible at a distance, tail black.

Loon. Nearly as large as a goose, pointed bill, blackish gray in winter plumage, white below.

American merganser (sheldrake). A large black and white duck, with a narrow bill. Feeds on fish.

American golden eye (whistler). A small black and white duck, with a short black bill and a white spot on each side of its greenish black head.

Old squaw. A small duck, largely white, with dark wings and a long pointed tail.

Redhead. A duck similar to the canvasback, but with a redder head and a grayer back.

While these are perhaps the most widespread and common of the winter water birds, there are a number of others of more or less rarity that may be seen. These are listed somewhat in the order of their abundance as follows: bufflehead, American scoter, white-winged scoter, surf scoter, lesser scaup duck, red-breasted merganser, Canada goose, brant, Holboell's grebe, great black-backed gull, ring-billed gull, Bonaparte's gull, puffin, Brunnich's murre, razor-billed auk, dovekie, kittiwake, glaucous gull, Iceland gull, and Kumlien's gull, the last nine or ten being very unusual anywhere except off the coast of Long Island.

Of the land birds those that will come to the ordinary feeding station near the window are as follows:

House sparrow (English sparrow). Familiar to every one.

Chickadee. Smaller than a sparrow, gray with black throat and cap.

White-breasted nuthatch. Somewhat larger than the chickadee, gray above with a black cap, white below; crawls about tree trunks, often upside down.

Downy woodpecker. Larger than a sparrow, black and white above, white below; climbs trunks of trees using tail as a support.

Hairy woodpecker. Similar to the downy in color, but much larger.

Brown creeper. Woodpecker-like in habit, smaller than a sparrow, streaked brown above, gray below.

Junco. Sparrow-like, slaty black above and below to the breast, sharp line separating the white under parts.

Tree sparrow. Sparrow-like, reddish brown cap, prominent wing bars, and a single spot in the middle of the breast.

Golden-crowned kinglet. Much smaller than a sparrow, greenish above and gray below, with a golden yellow stripe down the middle of the head.

These ten are the most common winter land birds. A few others may be expected from time to time as follows: red-headed woodpecker, flicker, goldfinch, purple finch, red-breasted nuthatch, cedar waxwing (eating berries or dried fruits), song sparrow, starling (common in the vicinity of New York City), pheasant, blue jay, redpolls, crossbills, pine and evening grosbeaks.

Out on the open wind-swept fields one may regularly look for horned larks and snow buntings feeding on the weeds that project above the snow. They are easily distinguished by the large amount of white in the plumage of the bunting, and the curious black markings about the face of the lark. With them is associated occasionally the Lapland longspur, a sparrow-like bird from the Northwest somewhat resembling the house sparrow, but with a buffy ring about the neck widening on the nape.

In the woodlands one can find the same birds that frequent the feeding stations, and usually a number of others that less often come so close to human habitations. Of the birds of prey, one may see the sharp-shinned, Cooper's, red-shouldered, red-tailed hawks, and the goshawks, and, more commonly still, the little sparrow hawk, and the screech, great, horned, barred, long-eared, short-eared, and occasionally saw-whet and snowy owls. In the orchards or along roadsides one may espy on some conspicuous perch a northern shrike, a bird about the size of a robin but light gray in color with black wings and tail marked with white and a black line through the eye; and in the woods or along the rocky streams, crawling about fallen logs or running under brush piles, one may see the curious little dark brown winter wren.

EVENING GROSBEAK AND PINE GROSBEAK

We should be on the watch for the evening grosbeak every winter. It has appeared, of recent years, in many parts of New York State and all over New England and never fails to cause considerable excitement among bird students. The evening grosbeak does not really belong in New York, but, being a more or less wandering species, strays from its customary route, stopping wherever food is abundant. It is a bird of

PHOTOGRAPH BY A. A. ALLEN

AN ARISTOCRATIC PENSIONER

A male evening grosbeak at a feeding station. This is a rare bird in New York State, appearing very irregularly. Two-fifths natural size

the northwestern United States and Canada, but when the snow is very heavy in the West and when the wild fruit crop is good in New York we may expect it here.

The evening grosbeak is about the size of a robin or a rose-breasted grosbeak. The males are primarily yellow with black wings and tail; the females are largely gray, with a yellowish wash about the neck. Both sexes have very heavy yellowish beaks and white markings in the wings and the tail which are conspicuous in flight. They feed on the seeds of box elder and sumac, wild cherries, and fruits of the mountain ash. Their

note is best described as an usually loud and voluble sparrow chirp, and is probably the only call they utter while in the East.

A flock of fifteen of these beautiful birds came to Ithaca in February, 1914, and spent a great part of their time at a feeding station. They were fed plenty of sunflower seed, which persuaded them to remain until May 15, when normally they are back on their breeding grounds.

The pine grosbeak likewise may be expected, and is perhaps a more frequent visitant in New York State, for it belongs to northeastern North America more than does the evening grosbeak. The pine grosbeak is nearly the size of a robin and the bill is noticeably short and heavy. In color the male resembles the purple finch, being slaty gray overlaid with rosy red. The color is lightest on head and breast. The female is largely gray, the red being replaced by yellowish. In both sexes the white wing bars are conspicuous. Unlike the evening grosbeak, the pine grosbeak seems to prefer the evergreens, and feeds on the fruits of pine, spruce, and hemlock, as well as on buds and fruits of other trees. It is a slow-moving, gentle bird, almost fearless of man. The flocks that appear in New York State are usually composed of females and immature birds, and the red males are scarce, not exceeding two or three to a flock of twenty.

CEDAR WAXWING

Where there are winter berries, such as virginia creeper, mountain ash, barberries, and privet, there the cedar waxwing is likely to stay in flocks throughout the cold months. Although not so much of a winter bird as the chickadee and the nuthatches, the waxwing often remains in the North, wandering from place to place in search of food. We should plant, therefore, about the school and the home some fruit-bearing tree or shrub that will hold its berries in the winter and attract these birds.

Surely the waxwing is one of the most beautiful and distinguished of all the birds of New York. Its sleek plumage, its crested head, and its erect carriage, mark it out from most others. Waxwings are slow moving and dignified. They take the berries from the branch almost daintily, and often one of them will pass the morsel to its neighbor. Thus a berry may go the length of a whole line of birds, the last one politely swallowing it.

The cedar waxwing, also called cherry bird from its habit of eating cherries in summer, is slightly smaller than a robin, with olive-brown, unstreaked plumage. Some of the feathers of the wing are tipped with waxlike spots of red, whence the name *waxwing*. Across the end of the tail is a band of yellow about a quarter of an inch wide and the chin is black. The waxwing can be recognized best, however, by its habit of resting erect on a branch or by its prominent crest. The waxwing has no song,

PHOTOGRAPH BY A. A. ALLEN

A CHERRY-BIRD'S HOME

A cedar waxwing about to feed its young. The food is carried in its throat instead of in its bill, and is regurgitated into the mouths of the young birds. One-third natural size

only a very high shrill *tsee-tsee* given often in flight as the whole flock wheels over the tree tops or alights, with one accord, in the crown of some tall elm.

Unlike all our birds except the goldfinch, the waxwings do not nest until midsummer, in July or August. The nest is usually placed in a fruit or a shade tree from ten to thirty feet from the ground and rests on the branch. It is somewhat smaller than a robin's nest and is made of grasses, a few sticks, and occasionally some mud. The four or five eggs are bluish gray, with concealed markings of lavender and black.

The young birds resemble the adults considerably, having the crests and the black marks through the eye and the band of yellow on the tail. When observed in the nest they have a curious habit of stretching their heads and necks straight up and remaining perfectly rigid until they think danger has passed. The young are fed upon fruit and insects which the parent birds carry in their throats. When insects are plentiful the waxwings feed largely on injurious pests, such as cankerworms, elm-leaf beetles, and even hairy caterpillars.

JUNCO

Size: About the size of an English sparrow.

General color: Slate color except for belly, which is white.

Distinctive features: When flying the junco displays white outer tail feathers. This, with its unstreaked slaty color, will distinguish it.

Bright light was streaming from all our clubroom windows. Within everything was cheerful, but without all was dark and cold, for it was

JUNCOS

Better known as "snow birds" from their habit of flocking about farmhouses after snowstorms, when their natural food of weed seeds is covered up. About one-half natural size

already late in October. Suddenly we heard a tapping at the window, and looking up we saw a flutter of wings against the glass. We hastened to open the window, and in flew a little bird.

Just the color of the night it was, without a streak or a spot except for a little apron of white extending from its breast backward. Even its throat and breast were slaty black. When it flew from the window to the bookcase, however, it showed us that its outer tail feathers were as white as its breast. It was a junco. Some persons would call it a snow-bird, but there is another bird which has that name; therefore we shall call this one a junco.

Why had the little junco come to our window, where had it been, and where was it going? I wish it could have spoken, for I am sure it could have told us many interesting adventures. It would probably have told us that winter was coming, and with it heavy snows in the North which would cover up all the weeds and seeds on which it depends for food, and that it was traveling toward the South where the snows are not so deep and where some of the weeds remain above the surface all winter. Like its other brothers it is afraid to travel during the day, when its enemies, the hawks, are hunting; therefore it flies with many others at night. On clear nights it flies very high, but on this cloudy night it had come close to earth so as to follow the landscape.

The junco could have told us how, in the spring, it had journeyed northward far up into a Canadian wood where it had found a place beneath a tangle of brush to build its nest and rear its family; and how, with the oncoming of cold weather, it had started southward where it knew it could find plenty of food.

The junco is most abundant in New York State during March and April and again in October and November, when it is traveling to and from its nesting ground. But if the snows do not become too deep it stays with us all winter, feeding about our doorsteps and along our fence rows. Oftentimes it travels in company with the tree sparrow, and a little careful search will reveal it in almost any weedy spot that is sheltered from the wind. The junco can easily be distinguished by its blackish color, for the tree sparrow is brown.

When you find a flock of juncos, watch them as they feed and learn what kind of food they prefer. A single junco destroys more weeds than will any number of boys, because it takes them in the seed. Note the heavy conical bill for crushing seeds. The junco is a sparrow, and all sparrows have this type of bill.

You will not hear the junco during the winter, but the first warm days of spring will start it singing. When you hear one, compare the song with others you have heard and learn to group the birds having similar songs. This is one of the easiest ways to learn bird songs. The junco's song resembles that of the chipping sparrow.

SONG SPARROW

Size: About as large as an English sparrow.

General color: Above, brown streaked with darker brown; below, grayish white streaked with brown.

Distinctive features: The streaks on the breast converge into one large spot in the center of the breast and one on each side of the throat. The song sparrow is one of the most common of the native sparrows and is always found in the neighborhood of bushes or thickets.

Surely the song sparrow is one of nature's greatest successes. No adverse circumstances have been able to daunt this hardy adventurer. So versatile is he that he has adapted himself to all sorts of conditions, and few are the places on this continent where some one of his kind cannot be found. No chill nor cloud nor rain can check his cheerful voice. Even darkness itself can only conceal the singer whose merry notes often break the midnight silence or add to the nocturnal chorus. Wherever there is a clump of bushes into which he can dive for protection from cat or hawk, we may hear his happy voice. It may be in our very barnyard or it may be in the thickets bordering the forest, for nearly everywhere he is one of our most abundant birds.

PHOTOGRAPH BY A. A. ALLEN

A HUNGRY SONG SPARROW IN LUCK

This bird and many other kinds came to the log for food that was placed there to attract them. About one-sixth natural size

Perhaps you do not know the song sparrow by this name, or cannot at present even recall his song. The boys sometimes call him "bush bird" or "long-tailed ground bird," but "song sparrow" is the preferred name. Surely you have seen the little brown bird sitting on fence rail or bush top, pouring forth his vivacious notes and diving into cover at your approach. Some birds fly up and away, depending for safety on flight; but not so the song sparrow. Always singing from an exposed perch, he depends for safety on cover, and flies into the nearest bush, pumping his tail up and down as he goes.

Unlike the vesper sparrow, the song sparrow is seldom found in the open field, and his nest, when placed on the ground, is always concealed by overhanging grass. Very often, however, the nest is placed in a low bush, so concealed by leaves and branches that one must actually get inside of the bush in order to find it. The nest is composed of rootlets, straws, and grasses, and is generally lined with long hairs. The eggs are blue and vary considerably in the amount of brown spots and blotches.

The song of the song sparrow resembles that of the vesper sparrow, but is not so clear a whistle and begins with three instead of two notes of the same pitch. The song has been described as fitting the words, *Madge, Madge, Madge, put on your tea kettle-ettle-ettle.* See whether you can compose words of your own to fit the song. The call note is the most characteristic and easily learned of any of the sparrows, being a rather distressed *chimp.*

All year long the song sparrows are with us in greater or less abundance. In winter the more northern birds move southward, but with a little search almost anywhere in New York State we can find the song sparrow all winter. At this time of the year, however, we seldom hear him singing and it is often necessary to tramp the brambles and brush heaps before we see him With the first few sunshiny days of spring he again comes out in full force, and it is not long before he is once more among our commonest birds.

Never far from the vicinity of bushes, the song sparrow is nevertheless one of the most common birds of village and farm. It may often be seen along the village streets or about dooryards, picking crumbs with the house sparrows. Much more abundant is it, however, along roadsides in the country, in bushy pastures, and in hedgerows.

WRENS

Size: Smaller than the English sparrow.

General color: Brown above, lighter below.

Distinctive features: The small size, brown-barred plumage, and habit of carrying the tail erect will distinguish the wrens from all other birds.

A jaunty and self-important little bird is the wren, singing its bubbling exuberant song from dawn until dusk, and ever busy with its own affairs and those of all its neighbors. This is true of all species of wrens, from the marsh wrens that live in the cat-tails, and the winter wren that lives in the forest, to the house wren that lives by our door.

The house wren seems to be fond of human society and usually selects a birdbox or any hole or crevice about buildings for its nesting site. Indeed, in most parts of the world, there is some member of the wren family that forms an attachment for the abode of man, though our own house wren is confined to eastern North America.

The wren is sometimes a mischievous neighbor, especially to other hole-nesting birds, because of its habit of filling all the boxes in the vicinity with sticks and other nesting material though it uses but one. In this way it often keeps other birds away. Sometimes it even molests them after their nests are built by stealing in, when unobserved, and puncturing or throwing out the eggs. In spite of this, we like the wren and are glad when it locates in our gardens, for, besides its merry disposition, it has most beneficial feeding habits, living entirely upon spiders and the insect pests of the garden. The house wren usually raises two large families a season. The nests are built of a variety of materials, commonly of sticks with a soft lining of feathers, but grass, weeds, and such unexpected things as snake skins and hairpins have been found in them.

A DELIGHTFUL SONGSTER

The house wren pays for the home that is put up for him with a rich warbling song and an insatiable appetite for obnoxious insects. About one-half natural size

The house wren winters in the Southern States, comes back to us during the last of April, and leaves again during October. Nesting boxes should be in place before the middle of April, either on a post of the porch or on a post in the yard, although the wren is not very particular and will sometimes take a box placed in the middle of a tree. The size of the hole is not important so long as it is at least three-quarters of an inch in diameter, although if it is less than an inch and a half it will keep out the house sparrows and give the wren a better chance. It is better to have the hole above the middle of the box, but wrens are not so particular as most hole-nesting birds in this respect.

PHOTOGRAPH BY A. A. ALLEN

NEST AND EGGS OF A HOUSE WREN

The coarse sticks are softened by a lining of feathers

All species of wrens seem much alike with their brown-barred plumage above, grayish or brownish under parts, and their short upward-tilted tails. The winter wren resembles most closely the house wren, but it is somewhat smaller and considerably darker in color. In New York the winter wren is confined in the summer to the Adirondacks and the Catskills and isolated hilltops or wooded swamps or ravines in other parts of the State. In winter or on its migration during spring and fall, it may occasionally appear in the garden shrubbery.

The long-billed and short-billed marsh wrens are the only other species commonly found in New York, and, as might be expected, they are rather local. The long-billed marsh wren is common wherever there are extensive marshes, hanging its globular nest in the cat-tails or the sedges. The short-billed species is much less common and prefers the drier borders of the marshes.

The Carolina wren, which occurs throughout the South, sometimes finds its way into New York State, especially in the lower Hudson Valley.

It is considerably larger and brighter than the house wren and usually confines itself to woodland tangles.

In color the eggs of wrens vary from those of the short-billed marsh wren which are pure white, to those of the long-billed marsh wren, which

OVENBIRD

This bird belongs to the warbler family, and is called ovenbird from its curious domed nest. About one-half natural size

are so heavily speckled as to appear almost uniformly brown. The eggs of the house wren are creamy or pinkish in ground color but are very heavily speckled with dark brown.

OVENBIRD

Size: Slightly larger than the English sparrow.

General color: Above, uniform olive-brown; below, white streaked with black.

Distinctive features: On top of the head is an orange-brown patch. This, with its general color and its habit of walking about on the ground in dry woods, will distinguish the ovenbird.

Teacher, *teacher*, *teacher*, *teacher*, *teacher*, a cry rings out through the woods, beginning so gradually and ending so abruptly that it is over before we realize that we have heard it. It is the song of the ovenbird. As a matter of fact, the accent in the word *teacher*, as sounded by the

PHOTOGRAPH BY A. A. ALLEN

NEST AND EGGS OF THE OVENBIRD

Built on the ground in the woods and roofed over like an old-fashioned Dutch oven, one may step on the nest without seeing it

ovenbird, falls on the second syllable so that the song sounds more like the syllables *chertée*, *chertée*, *chertée*, *chertée;* but, however that may be, it serves to announce the presence of this little inconspicuous warbler that might otherwise go unnoticed.

The ovenbird is one of the most dully colored warblers, and prefers for its abode the drier and more open woodlands, where the underbrush is scarce and where it can run around on the carpet of dead leaves and scratch for a living. It is one of the few birds that is as common in the center of extensive forests as along the borders.

The ovenbird nests on the ground and seems to have no particular preference for the spot where it will build, provided there is a thick carpet of leaves. Some of the leaves it raises up so that they serve as a roof for the nest, making it dome-shaped with the opening on one side, like an old-fashioned Dutch oven. It is this characteristic of the nest that has given the ovenbird its name. The three to five eggs, like those of other warblers, though a trifle larger than those of most, are white with brown specks thickest about the larger end.

The ovenbird winters from southern Florida to northern South America, arrives in New York State about the last of April or the first of May, and leaves again about the first of October.

One of the surprises in store for those who visit the woodlands at dusk or even after dark is the flight song of the ovenbird. It is a loud, high-pitched, erratic warble that is given with so much enthusiasm that it carries the singer high above the trees. Were it not for the fact that it usually terminates with the regular *teacher, teacher*, one would never guess that it was the song of the ground-loving ovenbird.

CHIMNEY SWIFT

Size: About as large as the English sparrow.

General color: Grayish black above and below.

Distinctive features: The chimney swift is seldom seen except when flying, often in the vicinity of chimneys. It appears very much like a swallow, but can be distinguished from all the swallows by its narrower wings, uniform sooty color, and apparently pointed tail.

PHOTOGRAPH BY A. A. ALLEN

CHIMNEY SWIFT WITH NEST AND EGGS

The nest is made of sticks glued together and to the inside of the silo by means of the bird's viscid saliva. Note how the bird clings to the wall. About one-tenth natural size

To our eyes there is not much similarity between a chimney and a hollow tree, but to the chimney swift, looking for a place to roost or a vertical wall to which to fasten its nest, there seems to be little difference. Indeed, as the number of chimneys has increased, the swifts have multiplied so

that to-day there are undoubtedly more swifts than when the white man first came to this country.

The chimney swift is sometimes called chimney swallow, but it is not a swallow in spite of the general similarity. If one examines the swift closely, it will be seen that the wings are quite a different shape from those of the swallows, being narrow at the base and slightly broadened at the tip. The tail feathers are armed with spines for assisting the swift in propping itself against the chimney, and its hind toe can be thrown around until all four toes are directed forward. Indeed the chimney swift is much more closely related to the hummingbirds than it is to the swallows. In flight, likewise, the swifts are different from the swallows and almost unique among birds, for they usually fly with alternate strokes of the wings though the movement is so rapid that it is almost impossible to determine this with certainty. It is plain, however, that they have none of the graceful swooping flight of the true swallows. With their tails closed they seem pointed at both ends and look like cigars with wings. They dart headlong after insects, usually beating back and forth through the swarms of gnats and mosquitoes high over the housetops instead of pursuing individual insects.

The most interesting thing about the chimney swift is its nest, which is composed of dead twigs. The bird breaks these from the tops of trees with the bill or the feet as it hovers for an instant above them, for the chimney swift never perches nor comes to rest outside of its chimney. The twigs are glued to the side of the chimney and to each other with a cement that is secreted by the bird's salivary glands. Thus a frail cup is formed in which the three white eggs are laid. The nest is strong enough, however, so that at times both birds sit upon it side by side. The young soon outgrow it and then are forced to cling to the sides of the chimney like woodpeckers. It is not unusual for them to lose their hold and fall into the fireplace below; indeed this also happens to the old birds occasionally.

Chimney swifts arrive in New York State from the middle to the last of April and leave again in October. Where they spend the winter is as yet unknown although they have been seen as far south as Vera Cruz, Mexico. During their migration they sometimes congregate in thousands, and can be seen pouring in or out of tall chimneys like smoke, for minutes at a time each night and morning.

WOOD THRUSH

Size: Smaller than a robin.

General color: Above, brown, brighter on the head; below, white with large round black spots.

Distinctive features: The large round spots scattered over the snowy white under parts will distinguish the wood thrush.

The larks and the finches are noted for the sweetness of their songs, the wrens for their volubility, and the mockingbirds for their finesse, but for quality, nature has designed the thrushes. From the nightingales of Europe, and the solitaires of the western mountains, to our own veerys,

PHOTOGRAPH BY A. A. ALLEN

WOOD THRUSH ON NEST

The wood thrush has a more spotted breast than any of the other thrushes. The nest is similar to a robin's, but usually contains moss and dead leaves. About one-fourth natural size

hermits, and wood thrushes, the purity, richness, and expression of the tones cannot be excelled. The hermit thrush in the mountains, the veery in the lowland woods, and the wood thrush in our gardens furnish us with music that, to those who have an ear for nature, is unsurpassed.

Few of the thrushes are brilliantly colored, the robin and the bluebird being the only exceptions. As a family they are brown above and white spotted with black or brown below. Species not spotted in the adult plumage usually pass through a spotted stage in the plumage of the young birds. Young spotted robins, so common during summer, furnish good examples of this. The wood thrush has the largest spots of any of our native thrushes; the hermit, the olive-backed, and the gray-cheeked have a few spots on the forebreast; the veery has scarcely any.

The wood thrush is found along the borders of woods and in parks and gardens where there are trees from which it can sing and high undergrowth wherein it can nest. For although it occasionally nests in trees, it prefers saplings or even large bushes. The nest is very similar to a robin's, being composed mostly of straws and grass with a middle layer

SPOTTED SANDPIPER

This bird is often called "tip-up" from its habit of bobbing its tail as though it had difficulty in balancing on its long legs. About one-third natural size

of mud. It usually, however, is built upon a platform of dead leaves and has one or more large pieces of paper fastened into it. The presence of moss among the straws will also help to distinguish it from a robin's nest. The eggs are blue and unspotted, very similar to those of a robin.

The wood thrush arrives about the last of April from Central America, where it has spent the winter, and leaves again about the first of October.

SPOTTED SANDPIPER

Size: Larger than the English sparrow, with long legs and bill.

General color: Above, brownish gray; below, white with dark spots.

Distinctive features: Its proximity to water, its long legs and bill, its spotted under parts, and its habit of teetering will distinguish the spotted sandpiper.

There are many kinds of sandpipers, about one hundred altogether, but with the exception of the Wilson's snipe and the woodcock, which

PHOTOGRAPH BY A. A. ALLEN

NEST AND EGGS OF THE SPOTTED SANDPIPER

The eggs are very large for the size of the bird and have to be fitted together before the bird can cover them well

are not typical, only one, the spotted sandpiper, remains in New York State for the summer. It is found about all lakes and streams, where its characteristic manner of running along the shore and bobbing its short tail whenever it stops, has given it the common names of "tip-up" or "teeter-tail."

All the sandpipers have long legs for wading in the shallow water and long bills for probing in the soft mud. The spotted sandpiper has the characteristic long bill of its family, though it spends a good deal of its time chasing flies and other insects that dart about mud flats. Mosquito wrigglers and midge larvae that live in stagnant pools also form an important item of its food.

The sandpipers are not song birds, but most of them have musical whistles, which are easily imitated, and which they will invariably answer. The call of the spotted sandpiper resembles the syllables *sweet, sweet, sweet, sweet, sweet, sweet, sweet,* sometimes given very clearly with a plaintive quality and at other times rather tremulously.

During spring and summer the spotted sandpiper is easily distinguished from other species by the black spots on its breast, but in its fall plumage the spots are lost and it is then rather difficult to distinguish from the other species that frequent the beaches and mud flats on their migration. Sandpipers are highly migratory. Many spotted sandpipers reach Brazil or central Peru during the winter, while other species that nest along the northern borders of North America sometimes wander as far south as Patagonia.

PHOTOGRAPH BY A. A. ALLEN

COMING HOME

A flicker returning to its nesting hole in a half-dead tree. The tripod of boards supports a camera used in photographing the flicker

All the sandpipers are poor nest builders and lay large brownish, heavily spotted eggs. The spotted sandpiper scratches out a slight depression among the weeds above the high water mark or sometimes rather far from the water, and puts in but a scant lining. The eggs are sharply pointed, and the points are always directed toward the center of the nest; otherwise the little sandpiper would have difficulty in covering them, so large are they. The young sandpipers, when hatched, are covered with down and are able to run about and follow the old birds like little chickens. If one discovers the nest or the young, the old bird trails along the ground in a most distressing manner as though it had a broken wing. When alarmed, the spotted sandpiper utters a note of two syllables, *tweet, tweet,* and flies low over the water with very short almost quivering strokes of the wings. At such times two grayish lines down the middle of each wing will serve to distinguish it from other species. It never flies far, and if flushed several times will eventually return to the point from which it started.

FLICKER

Size: A little larger than a robin.

General color: Dark brown above; light brown below, marked with round black dots. Quill feathers of tail and wings black above; golden yellow below.

Distinctive features: A scarlet crescent across nape of neck; white spot to be seen on the rump when flying. The flicker is our only brownish woodpecker.

FLICKER, OR GOLDEN-WINGED WOODPECKER

The flicker usually drills its own nesting hole in a dead tree, but will sometimes use a nesting box if it is properly built. About one-third natural size

The flicker is a noisy bird. From the time it arrives during the latter part of March or first part of April, until it leaves again in the fall, we can hear its strident notes at all times of the day. In addition to quite a variety of calls like those of other woodpeckers, the male also indulges in a rolling tattoo in the spring, and seems to delight in a hollow drainpipe or other resonant surface. His drumming may be heard for half a mile and may wake up every one in the neighborhood. Another curious habit of the flicker is often observed. Whenever two of them get together they perform an elaborate ceremony of bowing, bobbing, and strutting, during which the tail is stiffly spread, and various comical attitudes are assumed. It is at such times that they utter the call that gives them their name, *flicker-flicker-flicker*, or *wick-awick-awick*.

Although the flicker is a woodpecker, it frequently departs from the habits of its relatives and descends to the ground to feed on ants. Like all other woodpeckers, however, it excavates a hole in a tree in which

CATBIRD

Because of its varied songs and the power of some individuals of imitating other birds, the catbird is sometimes called the "northern mockingbird." About one-third natural size

to rear its young. The opening is usually about two and a quarter inches in diameter, and the hole is from twelve to twenty-four inches deep, the bottom of the hole being enlarged into a chamber on the floor of which are laid the five to nine glossy white eggs.

CATBIRD

Size: Smaller than a robin.

General color: Slaty gray above and below, with a black crown and a chestnut patch beneath the tail.

Distinctive features: Its slender build, its uniform gray color, and its habit of keeping to the thickets will distinguish the catbird.

The catbird is the sentinel of the bird world. If a marauding cat sneaks through the shrubbery, or if a sharp-shinned hawk dashes past

PHOTOGRAPH BY A. A. ALLEN

NEST AND EGGS OF THE CATBIRD

The nest is always built in a thicket and has a foundation of sticks and a lining of rootlets. The eggs are deep bluish green

to lurk in the shelter of a thick tree, or if a sleepy owl tries to spend the day in a neighboring thicket, the catbird is the first to discover it and sound the warning. Not content with mere cries of alarm, it bristles up its feathers and dashes at the intruder with no sign of fear. Indeed the person who dares to approach too close to its nest or its young may have to shield his face from the attacks of this daring bird.

The catbird is well named, for not only is its sleek gray color suggestive of a maltese pussy but its notes are easily mistaken for the meowing of a kitten or a petulant cat. These catcalls, however, are not its only notes, for many individuals sing so beautifully and with such variation that the catbird has been given the name of northern mockingbird. Indeed the songs of some catbirds have duplicated almost exactly those of the

robin, the rose-breasted grosbeak, and the red-eyed vireo, and their songs are nearly always suggestive of those of some other bird.

The catbird is never found very far from thick shrubbery, and in open country or in gardens where there are no thick bushes it is always absent. The thickest bush is usually chosen for its nest, which is a rather bulky structure with a foundation of twigs and bark lined with black rootlets. Its three to five eggs are deep bluish green without spots of any kind.

The catbird arrives in New York State about the last of April, and leaves again during the latter part of October. It spends the winter from the Southern States south to Panama. Once in a great while a lone catbird is left behind and tries to winter as far north as New York.

The catbird is one of the most valuable birds we have in its destruction of insects because it does not hesitate to go right out into the garden where it is most needed. It is very fond also of berries and cherries, and sometimes becomes unpopular because of stealing these fruits. Most persons, however, are quite willing to pay a little for its services.

GUINEA FOWL

Size: Smaller than the domestic hen.

General color: Slate color speckled with white, or sometimes all white.

Distinctive features: Small, naked head, slender neck, and plump body.

There is perhaps no domestic bird or animal that has changed less than the guinea fowl through captivity and long association with man. It was originally domesticated by the Romans, but it did not become common in Europe until the sixteenth century. In the wild state it lives in the forested regions of western Africa about the Gulf of Guinea, on some islands off the coast of Africa, and in the West Indies, where it was introduced. Even in domestication it retains much of its original wildness, which makes it a somewhat difficult bird to raise. The majority of the domesticated birds are exactly like their wild ancestors, being slaty black in ground color evenly speckled with white. Some individual birds, however, show a tendency toward albinism, the under parts or the wings being white, and some breeds are pure white. The color of the legs and the feet has likewise changed in some individuals, being bright orange instead of grayish brown.

Guinea fowls are extremely noisy and are often kept because of the warning they give when a hawk or a fox appears. Although they are able to fly, they prefer, even in the wild state, to run through the thick brush to escape their enemies. They hide their nests in thickets, where they lay eggs that are smaller than the ordinary fowl's and speckled like a turkey's. The young birds are peculiarly striped with different shades of brown and are rather delicate and difficult to raise because of their timidity.

BIRD QUOTATIONS

NESTING TIME

The little bird sits at his door in the sun,
  Atilt like a blossom among the leaves,
And lets his illumined being o'errun
  With the deluge of summer it receives;
His mate feels the eggs beneath her wings,
And the heart in her dumb breast flutters and sings;
He sings to the wide world, and she to her nest,—
In the nice ear of Nature, which song is the best?

From *The Vision of Sir Launfal*
by JAMES RUSSELL LOWELL

WINTER BIRDS

From out the white and pulsing storm
  I hear the snowbirds calling;
The sheeted winds stalk o'er the hills,
  And fast the snow is falling.

Like children laughing at their play
  I hear the birds a-twitter,
What care they that the skies are dim
  Or that the cold is bitter?

On twinkling wings they eddy past
  At home amid the drifting,
Or seek the hills and weedy fields
  Where fast the snow is sifting.

From *Snowbirds*
by JOHN BURROUGHS

ROBIN

I wonder how the robin's throat
Hath caught the rain's sweet dripping note,
That little falling, pelting sound,
Liquidly clear and crystal round,
The very heart-rune of the Spring,
Enchanted of the sky and ground,
That conjures life from everything.

From *The Enchantment*
by SARA KING

OVENBIRD

Daintily the leaves he tiptoes;
Underneath them builds his oven,
Arched and framed with last year's oak leaves,
Roofed and walled against the rain-drops.

Hour by hour his voice he raises,
Mingling with the red-eye's snatches,
Answering to the hermit's anthem;
Rising — falling, like a wind breath.

From *Chocorua's Tenants*
by FRANK BOLLES

CHIMNEY SWIFT

Deep and narrow, and dark and lonely,
The sooty place that you nested in;
Over you one blue glimmer only,—
Say, were there many to make the din?

This is certain, that, somewhere or other,
Up in the chimney is loosely hung
A queer-shaped nest where a patient mother
Brooded a brood of tender young.

From *The Chimney Nest*
by MARY BARKER DODGE

THRUSH

Hark, where my blossomed pear-tree in the hedge
Leans to the field and scatters on the clover
Blossoms and dewdrops — at the bent spray's edge —
That's the wise thrush; he sings each song twice over
Lest you should think he never could recapture
The first fine careless rapture!

From *Home-Thoughts from Abroad*
by ROBERT BROWNING

CATBIRD

The pussy-cat bird has the blackest of bills,
With which she makes all of her trebles and trills;
She can mimic a robin or sing like a wren,
And I truly believe she can cluck like a hen;
And sometimes you dream that her song is a word,
Then quickly again — she's a pussy-cat bird.

From *The Pussy-cat Bird*
by CLINTON SCOLLARD

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POULTRY STUDY

The Editor

INTEREST in poultry is closely related to bird study, and can be maintained throughout the year. Many boys and girls have charge of flocks of poultry at home, and the school study can be directly related to the home practice, a combination offering many opportunities for educational development. Naturally the poultry work is most adaptable to rural communities, but many village dwellers keep small flocks, and a study can be made of the living birds and of the actual conditions of poultry raising.

In a general way there are two phases to poultry study, one dealing with practical selection, care, and handling of poultry; the other dealing with natural characteristics and habits of the birds as members of the animal kingdom. In the September 1915 Cornell Rural School Leaflet a series of articles on the practical phases was given. They dealt with such subjects as (1) types of farm poultry, (2) the common breeds of poultry, (3) improving the quality of poultry, (4) winter quarters for pullets, (5) feeding for winter eggs, (6) selecting and keeping eggs for hatching, (7) hatching eggs with a hen, (8) hatching eggs with an incubator, (9) brooding and care of chickens with a hen, (10) care of brooder and chickens, (11) feeding young chickens, (12) fattening poultry, (13) candling market eggs on the farm, (14) grading and packing eggs for market, (15) exhibiting poultry; and in addition a plan for raising a flock of chickens at the schoolhouse. Teachers are urged to refer to these articles because many children find their greatest interest in the actual business side of poultry study.

At present the question of feed for poultry is a difficult one both because of the scarcity of certain standard kinds and because of high prices. Consequently feeding practices have to be constantly revised and modified. It would perhaps be valuable to the community for the school to obtain from the Department of Poultry Husbandry of the College its latest suggestions on feeding.

The natural history side of poultry study offers many interesting possibilities, and the following pages contain standard information with which teachers should be familiar in guiding the observations of children. These articles have been furnished by the Department of Poultry Husbandry and have been published here and there in the leaflet in years

past. They are here much condensed, but teachers will be quick to see the interest that children will take in such matters as the different parts of a fowl's body, the feathers that belong to certain parts, the different markings and colors of feathers, and the different kinds of combs and the way in which these help in identifying the various breeds and varieties.

The special study of an individual bird brought to the schoolroom for a day will be full of interest. The general article by Mrs. Comstock (p. 58) offers suggestions for this.

The following ways of introducing the study of poultry so that it will appeal to the children as a vital and living interest are suggested:

1. A hen, a chicken, a duck, or any other individual of the poultry world can be brought to the schoolhouse for a day and studied.

2. A survey of the poultry interests of the community may be made, including such points as (1) number of flocks, (2) size of flocks, (3) kinds of poultry, breeds and varieties, (4) care of poultry, housing, feed, (5) how the products are used and marketed.

3. A successful poultry keeper may be persuaded to come to the school and present to the children some phases of the work.

4. A trip to a poultry farm if carefully planned and conducted will give the children much practical knowledge.

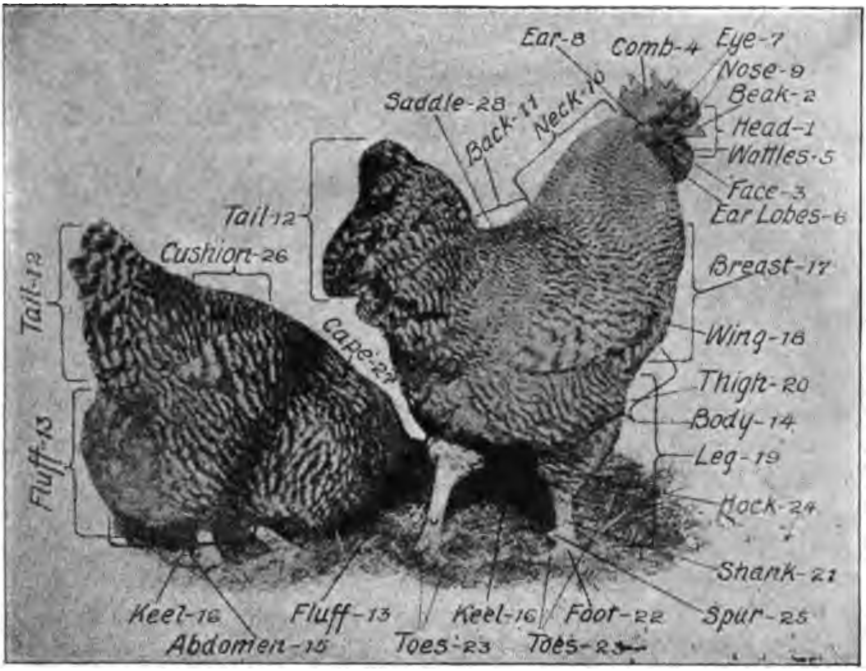
5. In the spring a flock of chickens may be raised at the schoolhouse by setting a hen in a woodshed or some place where conditions are right.

6. Various mounts and charts may be prepared in relation to poultry. In all such work effort should be made to keep it as original as possible.

7. Children should be encouraged to assume partial or complete care of the home flock.

8. Children of eligible age and grade should be encouraged to undertake a junior home project in poultry or to enter contests and exhibits.

9. A local poultry show may be held at the schoolhouse.



PARTS OF A FOWL

The names of the different parts of a fowl are given in the accompanying illustration, and are briefly described as follows:

1. Head. Includes face, eye, beak, comb, and other head parts.

2. Beak. The upper and lower horn-like parts of the mouth. For biting and tearing.

3. Face. The part of the head between the eye and the beak.

4. Comb. The fleshy growth on the top of the head. For ornamentation.

5. Wattles. The fleshy growths attached to the throat and the lower part of the beak. For ornamentation.

6. Ear lobes. The fleshy enlargements on the face below the ear. For ornamentation.

7. Eye. The organ of sight. Note the method of opening and closing the eyelid.

8. Ear. The organ of sound. Observe the simple opening without external ear parts.

9. Nose. The opening to the air passages at the base of the beak.

10. Neck. The part that unites the head with the body, and allows the head to be turned freely in various directions.

11. Back. The part of the body between the neck and the rump.

12. Tail. The rump and the feathers that are found on it. For guiding the body during flight.

13. Fluff. Soft feathers covering the abdomen.

14. Body. The under part and sides of the fowl, including the fluff.

15. Abdomen. The part of the body between the rump and the keel covered by the fluff feathers.

16. Keel. The lowest part of the body between the abdomen and the breast bone. Heavy, low-hanging part of body giving balance and steadiness in flight.

17. Breast. The part extending from the lower part of the neck to the keel. It is formed by the large muscles (white meat, pectorals) which move the wings during flight. Feel for the wishbone.

18. Wing. The organ of flight. Stretch it out like a fan and note its large size and overlapping feathers.

19. Leg. The organ of locomotion, including feet, shank, hock, thigh, and "second joint."

20. Thigh. The "first joint" of the leg above the hock.

21. Shank. The part of the leg between the foot and the hock. Note the large scales on the front side to protect the shank from injury.

22. Feet. The lower parts of the leg, including the toes. Used for scratching and perching. Move the shank up and down at the hock joint and observe the toes move.

23. Toes. The appendages of the feet.

24. Hock. The joint between the thigh and the shank.

25. Spur. The horny growth on the shank. Used for defence in fighting.

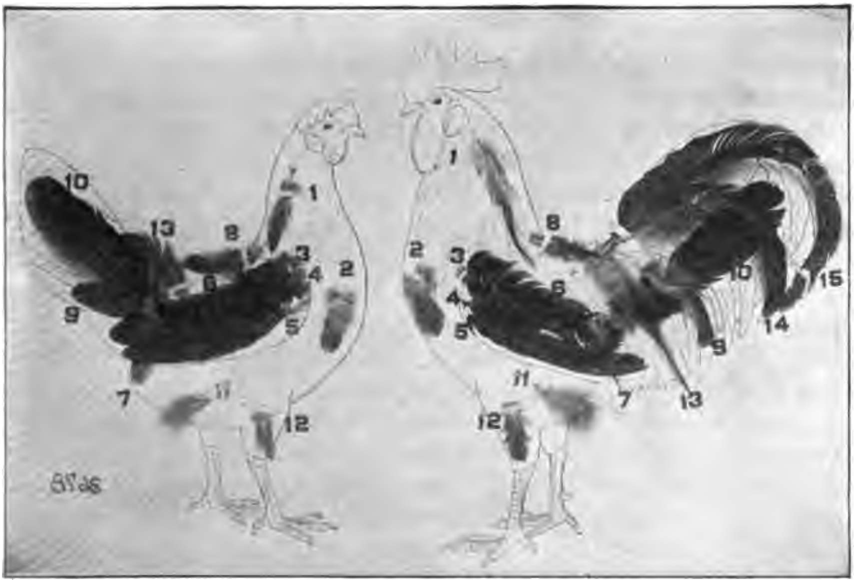
26. Cushion. The feather section of the female overlapping the base of the tail.

27. Cape. The feather section of the female at the juncture of the neck and the back.

28. Saddle. The feather section overlapping the base of the tail of the male.

SHAPE AND LOCATION OF FEATHERS

The feathers on the different parts of a fowl's body are distinctive and may readily be learned. An interesting aid in this study is the preparation of a feather mount, made by placing the different feathers on a full-sized outline drawing of the fowl in the positions that they occupy in life. The following illustration and accompanying list of names will be valuable as a standard for this work.



STANDARD POULTRY FEATHER MOUNTS

Female	Male
1. Neck hackle	1. Neck hackle
2. Breast	2. Breast
3. Wing shoulder covert	3. Wing shoulder covert
4. Wing flight covert	4. Wing flight covert
5. Wing primary	5. Wing primary
6. Wing secondary	6. Wing secondary
7. Wing covert	7. Wing covert
8. Back	8. Back
9. Cushion	9. Tail covert
10. Main tail	10. Main tail
11. Fluff	11. Fluff
12. Thigh	12. Thigh
13. Tail covert	13. Saddle hackle
	14. Lesser sickle
	15. Sickle

COLOR MARKINGS OF FEATHERS

The different varieties of poultry are often distinguished by the feather markings, and it is interesting to learn the different kinds and the breeds and varieties to which they belong. Perhaps it would also be possible to make a collection of as many kinds of feathers as could be obtained in the district.

The accompanying illustration and the following definitions of the different markings with indication of the breeds and varieties on which they are found, will be of assistance in this work.

FEATHER MARKINGS

Barred (Barred Plymouth Rock, Dominique). A feather having bars across the web at right angles to the shaft.

Horizontal penciled (Silver- or Golden-penciled Hamburgs). A feather having narrow, straight stripes across the web at right angles to the shaft.

Crescentic penciled (Partridge Cochin, Indian Game, Partridge Wyandotte, Silver-penciled Wyandotte). A feather having narrow stripes on the web that follow the outline of the feather, forming a crescent.

Striped (hackle of Brahmas and Brown Leghorns, and Silver- or Golden-laced, Silver-penciled, or Partridge Wyandotte). A feather having a dark stripe through the center on a web of lighter color.

Spangled (Silver- or Golden-spangled Hamburgs). A feather having a dark-colored, roundish marking on the web near the tip.

Laced (Silver or Golden Wyandotte). A feather having a dark-colored edging about the web of a light-colored feather.

Stippled (breast of a Rouen Drake). A feather having fine, dark-colored markings irregularly placed over the web.

Splashed (Houdans, Anconas, and Jubilee Orpingtons). A feather having irregular markings of various colors on the web.

FEATHER COLORATION

Solid white (White Plymouth Rock, White Wyandotte, White Leghorn). A feather without other color than pure white in quill or web.

Snow white — designating special purity of white.

Creamy white — white having a slight tinge of yellow.

Yellow white — white having a pronounced tinge of yellow.

Brassy white — white showing brilliant yellow cast.

Solid black (Black Minorca, Black Cochin, Black Leghorn, Java, Black Langshan). A feather without other color than black in quill or web.

Brilliant black — black glistening with brilliancy.

Dull black — black lacking luster.

Black with green sheen—black reflecting brilliant green in the sunlight.

Black with purple barring — black reflecting deep purple in the sunlight.

Solid buff (Buff Cochin, Buff Leghorn, Buff Plymouth Rock, Buff Wyandotte). A feather without other color than buff in quill or web.

Rich golden buff — bright and uniform.

Pale buff or light buff — lacking strength of buff color.

Mealy — irregularly marked with lighter buff, giving the effect of having been sprinkled with meal.

Medium buff — between light and dark buff.

Red (Rhode Island Red). A feather without other color than red in quill or web.

Mahogany red — rich, brilliant, dark red, almost black in the shade.

Dark red — a deep, rich shade of red.

TYPES OF COMB

An important distinguishing characteristic of the breeds and varieties is the type of comb.

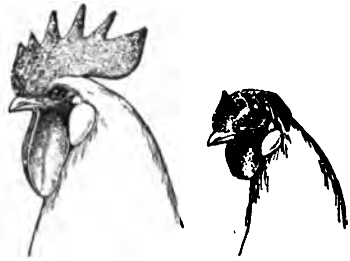
1. *Single comb.*— The single comb consists of a single piece of notched fleshy growth. It may be large, medium, or small; thick or thin; deeply or lightly notched; erect or lopped; and may have few or many points, depending on the breed. Plymouth Rock, Leghorn, Black Minorca, Rhode Island Red, Langshan, and Orpington have single combs.

2. *Rose comb.*—A thick, solid comb, covered at the top with fine points and terminating in a conspicuous spike in the rear, is called a rose comb. Wyandotte, Rose-comb Leghorn, Hamburg, Rose-comb Rhode Island Red, and others have rose combs.

3. *Pea comb.*— A pea comb resembles three low, thick, slightly notched single combs, grown together, the center comb being slightly higher than the other two. Brahma, Indian Game, Buckeye, and Sumatra have pea combs.

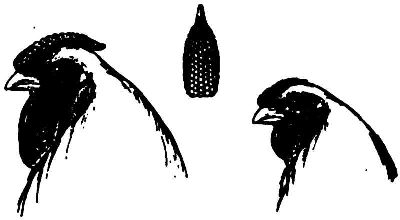
4. *V-shaped comb.*— The V-shaped comb consists of two small, divided horn-like or leaf-like projections, varying in size and shape with the different breeds. La Fleche, Houdan, Crevecoeur, Polish, and Sultan have V-shaped combs.

5. *Strawberry comb.*— The strawberry comb is so named because of its similarity in shape and color to a ripe strawberry. Malay and Silky have strawberry combs.



WHITE LEGHORN

Single comb, medium to large, five points, deeply serrated. Female comb lopped



WYANDOTTE

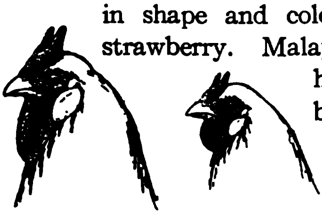
Rose comb, low, medium, oval spike following the curve of the head

BRAHMA

Pea comb, medium, evenly and slightly serrated in three rows

MALAY

Strawberry comb, small, symmetrical, finely serrated, set slightly toward the front of the head



LA FLECHE

V-shaped, medium, spike comb, medium to small size

KEY TO BREEDS AND VARIETIES OF FOWLS

Boys and girls become interested in studying breeds and varieties of fowls; and teachers often like to consider the characteristics and variations that distinguish one breed from another. A key to breeds and varieties of fowls has been worked out by the Department of Poultry Husbandry at the New York College of Agriculture to aid in the determination of different breeds and varieties of domestic fowls. This key includes practically all of those mentioned in the American Standard of Perfection. Any teacher or pupil may obtain a copy of this key by writing to Professor James E. Rice, New York State College of Agriculture, Ithaca, New York

THE HEN

ANNA BOTSFORD COMSTOCK
Assistant Professor of Nature Study

Knowledge of our domestic fowl leads us to believe that it is descended from the jungle fowl of Asia, which, although a ground bird, has a powerful flight. Ages of disuse of its wings, however, have robbed our barnyard fowl, to a great extent, of the ability to fly; moreover, the hen has been bred for food until she has attained too great weight to be carried by her wings.

It is the hen's nature to scratch for a living. For this purpose her legs are strong and protected by horny scales, and her flexible toes are armed with horny claws. Her beak is also strong and horny, so that she is able to extract from the earth the insect or the seed there hidden. She does not need teeth, since she swallows her food whole and it is ground fine in her gizzard. The hen also uses her beak as a weapon of offense and defense.

The hen can run rapidly. The track she makes shows four toes, one projecting backward and three forward. The long hind toe enables her to retain her hold on the perch when she sleeps; the bending of her legs as she settles down on the perch flexes her toes inward and downward, and thus they grasp the perch mechanically while she rests.

The hen's nostrils are two small holes near the base of the beak. She probably has not a keen sense of smell. Her hearing, however, like that of all birds, is very acute. The ears in some varieties of fowl are mere openings in the head, more or less covered with feathers, though some breeds have ear lobes which seem to be more ornamental than useful. The hen can see well. She is able to make her eyes far-sighted or near-sighted at will, to serve her when scratching for seeds at her feet or when watching for hawks in the sky. Her eyes are at the sides of the head, and she has a habit of reenforcing the judgment of one eye by bringing the other to bear on any object in view. The iris is usually yellow, the pupil black

STUDYING A HEN IN THE SCHOOLROOM

and round. When she winks, it is the lower lid that covers the eye; and when she is dozing a thin film-lid slips over the eye from its inner corner.

Birds are the only creatures clothed in feathers, a covering superior to hair and fur, since it gives them the power of flight. The feathers on different parts of the fowl differ much in size and form. The feathers on the back form a roof; they are closely webbed, overlap like shingles, and have pointed tips. The plumage on the breast is softer, and each

breast feather is closely webbed at its tip and fluffy at its base. The fluff, being next to the skin, helps to retain the heat of the body. This fluff, commonly called down, is the only covering of little chicks. The fluff has no quill. When new feathers come, either on the chick or on the hen, they are called pin feathers, because they are enclosed in a pointed sheath. To make her coat waterproof, the hen possesses on her back, near the tail, an oil gland from which she squeezes the oil with her beak and applies it to her feathers.

The feathers of the wing are wonderfully adapted to their service. The strong shaft of each is slightly curved and has a tightly knit web, which enables it to press down on the air. When a bird starts to fly it beats its wings very rapidly; thus the curving undersurfaces catch the air like an umbrella and lift the bird upward. While the lifted wings are carrying the bird, the tail acts as a rudder, by which the bird may steer itself in any direction. For this purpose the tail feathers have a different shape and texture from those on the wings. They are straight-shafted with the webs equal on both sides.

The feathers on the barnyard fowl are not only a protection from the rain and cold and of use as organs of flight, but they also make the bird beautiful. The rooster's long curling plumes and handsome collar feathers add much to his beauty, and obtain for him the admiration of his flock.

In the early spring the hen begins to lay eggs regularly, one each day, announcing the fact with triumphant cackling. She will make her own nest on the ground if we do not provide her with one in the poultry house. When sitting, she seldom allows her eggs to become cold; she turns them daily by pushing them with her breast and her beak; she leaves the nest for food and drink, usually twice a day. The incubation lasts about twenty-one days.

The chick has on the upper tip of its beak a small, horny tooth with which it breaks through its shell. Soon after birth this tooth disappears. When the chick leaves the egg it is covered with down, and is active, bright-eyed, and alert, ready to follow its mother anywhere in search of food. It is very different in appearance and actions from the young robin, which is blind and naked and is nourished by the food brought by its parents. When the chick is young it sleeps under its mother's wing, but as it grows up it roosts on trees or perches and tucks its head beneath its wing.

The conversation of the barnyard fowls is rather extended. The hen clucks to her chicks, and they answer by peeping. When she sees a hawk or any other peril she warns her brood by a peculiar note, which causes every chick to run to cover and remain motionless. When a chick is lost its peep is loud and pitiful; when it cuddles under its mother's wing its

note is full of contentment. The hen's spring song is one of the most joyous sounds of nature. Her triumphant cackle over the newly laid egg is quite different from her cackle that results from surprise; when she is very much afraid she squalls; and when grasped by the enemy she utters loud squawks. The rooster crows to assure his flock that all is well and to challenge other roosters. When hens take their dust baths together they seem to gossip with each other. These dust baths are very essential to the good health of fowls kept in close yards. They help to relieve the fowls of vermin and to cleanse their skin, for hens are not water bathers, as are the song birds.

When roosters fight they confront each other with lowered heads, and use their beaks, wings, and spurs as weapons.

SUGGESTIONS FOR STUDY

The following questions should be answered by the children from actual observations:

Can a hen fly like a robin or a swallow? If not, why? Where does the hen find her food? Where does the swallow find its food? Does the hen need to fly like the swallow?

What tools has the hen for getting her food?

Why are her toes so long and strong? Why have they horny claws at their tips? What covering protects the feet and legs? How are the feet and legs fitted for scratching the soil?

After the hen has found the insect or the seed by scratching in the earth, with what does she seize it? How is the beak fitted by size, shape, and covering, to obtain the food?

Has the hen any teeth? How is the food ground fine for digestion? Does she need any teeth? Why is it necessary to feed grit or small gravel-stones to fowls kept in close yards? Does the hen use her beak for anything else than picking up food?

Can a hen run rapidly? Note how the hen uses her wings in running. What sort of track does she make in mud or snow? Make a sketch of the track of a hen. How many toes show in the track? Numbering her toes with the hindmost projecting toe as first, how many toes has she?

Where does the hen sleep? How does she keep her hold on the perch while sleeping?

Can you see the hen's nostrils? Are they large? Describe the surface surrounding them. Do you think that the hen has a keen sense of smell? Why?

Has a hen ears? Where are they and how do they look? Have they lobes, and, if so, do you think these lobes are ornamental or an aid to hearing?

What is the color of the hen's eyes? What is the shape of the pupil? How does the hen wink? Can you see a little film-lid come out of the corner of the eye and cover it when she is drowsy? Do you think the hen can see far and well? How far off can she see a hawk? Can she see an object with both eyes at once? Why does the hen turn her head first this way and then that when looking at you? What advantage is it to the hen to have her eyes directed sidewise instead of both focusing in the same direction?

How does the covering of birds differ from the covering of animals? Study a feather and learn the shaft or quill, the web, the fluff, the barbs, and the barbules. If you have a microscope, or even a good double lens, examine a wing feather and see the little hooks on the barbules which hold the web together.

How are the feathers arranged on the back of a hen? Why? How does the hen look when standing in the rain?

How are the feathers arranged on the breast? Compare a feather from the back with a breast feather and note the difference.

Are both ends of a breast feather alike, and if not, what is the difference? Is the fluffy part on the outside or next to the bird's skin? Why? Why is the smooth part of the feather on the outside?

When feathers are all fluff what are they called? At what age is a fowl entirely covered with down?

What is a pin feather?

How do hens keep their feathers oily so that they will shed water? Where does the hen get the oil? Describe how she oils her feathers and which ones she oils most. Is she likely to oil her feathers just before a rain?

When you have an opportunity, look at a fowl all plucked ready for market or oven, and see how the wings of a bird correspond with the front legs of an animal or the arms of a human being.

Examine the wing of a hen with the feathers on. How are the feathers arranged to press down on the air? How does a bird lift itself in the air when it starts to fly? What does the wing press against? Can you press against air? If you carry an umbrella on a windy day, which catches more wind, the upper or the under side? Why? How does the wing of a bird correspond to the umbrella?

Examine a wing feather. Are the barbs equally long on each side of the quill? Is the wing feather curved? Is the concave or the convex side uppermost on the wing? Why? Which way does the feather bend most easily?

If the bird flies by pressing its wings against the air on the down stroke, why does it not push itself down on the up stroke?

Look at a tail feather and see how it differs from a wing feather. Does a hen, when she is flying, keep her tail closed or open like a fan? Have you ever seen a young robin, with tail not yet grown, try to fly? How did it act? Do you think a bird could sail through the air if it had nothing to steer with? What is the bird's tail used for?

Are the feathers of the hen beautiful in color? Which is the more handsome, the hen or the rooster? Note the difference in shape and color of the tail feathers of hen and rooster. Do the graceful, curving plumes in the tail of the rooster help him any in flight? Are they stiff enough to act as a rudder? If they are of no use in flight, nor in keeping him warm, nor in keeping off the rain, then what are these beautiful plumes for? Is the rooster's plumage beside the tail ornaments more beautiful than the hen's?

Name all the ways in which feathers are useful to the hen.

Observe the combs and wattles of the rooster and the hen. In which are they more showy?

At what time of year does the hen naturally lay the most eggs? How many does she lay in one day? When would she naturally stop laying? How does she announce to the world that she has laid an egg?

How does a hen make her nest if we do not make it for her? How many eggs can she sit on at once? How does she care for her eggs when she is sitting? How often does she come off her nest while sitting? How long does it take her eggs to hatch?

How does the chick get out of the eggshell? For what purpose is the little tooth on the tip of the young chick's beak? What becomes of this tooth?

What is the difference between the covering of a chick and of a hen? The chick has wings, can it fly? Why not?

How does the newly hatched chick differ in appearance from the young robin? Which is the stronger and more active? Where and how does the young chick get its food? Where and how does the young robin get its food? Where does the chick sleep at night?

What noise does the chick make when following the mother hen? When lost? When frightened? When cuddling under the mother's wing?

What noises does the hen make when with her brood? When she finds food for them? When she sees a hawk? How do the chickens obey their mother's call?

How does a hen drink? Why? Does a pigeon drink in this way? Do other birds?

Note how a hen expresses suspicion, fright, terror, and happiness.

How do hens fight? How and with what weapons do roosters fight?

What is the chief note of the rooster? When does he crow and why?

Describe how a hen dusts and suns herself. Why does she do this?

ANIMAL STUDY

THE EDITOR

HOW should a teacher prepare for animal study? First, she should read over the technical material on the different topics, and make notes of any suggestions that appeal as being of special interest or adaptability to the community. Opportunity will probably present itself very early in the year for some contact with animals. The first interest need not necessarily be in any one of those in the syllabus list for this year. Once the children are awake to the possibilities involved in an intelligent study of animal life, they will readily respond to suggestions that the teacher makes as a result of her background of knowledge, and her chief task then is to guide the work and keep it progressive and wholesome.

The syllabus calls for a special study of the earthworm and the cow during the year. At first thought one is not likely to consider the earthworm an animal, but a moment's reflection shows that it certainly is not an insect, and must be a very low form of animal life. It is a very interesting form in spite of its rudimentary development, and when we add to this the fact of its usefulness to man, a special study is well worth while. Moreover earthworms abound everywhere, and all children are familiar with them from earliest years.

The study of cows and all that relates to them is considered so important in New York State that the syllabus calls for it every year. Special comment on this phase of the work will be found on page 68 introducing the technical material.

The list of animals for recognition during the year 1918-1919 includes: sheep, weasel, snail, rabbit, and deer. In some sections it will be difficult to have contact with the weasel and the deer. In this case, not a great deal of time should be devoted to their study, because textbook work involves loss of interest and is not in keeping with the spirit of nature study at its best.

Sheep are gaining steadily in importance on New York State farms. For this reason somewhat more complete material is given for this topic than for the others in this group. In almost every rural school district there will be some child whose parents own sheep. Perhaps the school can visit the flock some day to learn how the animals look and act, how they are cared for, what they eat, and the like. Perhaps some child will have a pet lamb that can be brought to school some day. The children will be delighted with this, recalling their friend Mary of Mother Goose

fame, and the little visitor may be made the opportunity for many lessons. The preparation of a chart showing sheep products is a most valuable exercise.

Should a weasel be caught by any one in the district, the opportunity should be seized to let the children see and study it, discussing the reasons why it is an enemy to man's interests, and the ways in which it may be destroyed most humanely. These same statements apply to many wild animals, such as woodchucks, foxes, skunks, and muskrats.

Snails abound everywhere and have a fascination for children. How interesting snails were to one school is shown in the following extract from a teacher's letter:

> Snails are very interesting pets. They seem perfectly contented in the terrarium. All they need is moist sand, lettuce, and a dish of water. Their graceful and dignified progress to food or water is delightful to behold. Sometimes we have been fortunate enough to see one digging the hole for its nest. The quick half-turn of the body as the "foot" is pressed into the sand soon excavates the cavity to about an inch in depth. Then the eggs are deposited and covered. No pearl is more beautiful and lustrous than a snail's egg. After some time in the terrarium the mother snail seems to lose her desire to conceal her eggs, and does not cover the opening. Indeed the eggs will fill and overflow the nest. This confidence in her surroundings was once misplaced. A small green salamander dwelt near by. One morning he could not be found. A diligent search revealed the tip of his tail protruding from Madam Snail's nursery. Of course, he was promptly drawn out, but we noticed very few baby snails that year. When the eggs hatch, we show the tiny snail by placing it on a piece of white paper. The shell and the horn are perfect in shape.

At some time in their lives most children own pet rabbits, and this is one of the animals that may be most easily and interestingly studied. The probable growing importance of domesticated rabbits for food, is an added reason for studying this animal. Boys and girls also know something of the wild cottontail and its ways. They can discover more by patient study and investigation. In this connection Ernest Thompson Seton's story of Raggylug always delights and instructs.

In some sections of the State, school boys and girls still occasionally see a wild deer. They are not likely to forget it. A study of this beautiful animal that is hunted for part of the year, opens up various worth while considerations, such as the attitude we should take toward hunting, the protective game laws, and the like.

EARTHWORM

(For special study)

Anna Botsford Comstock
Assistant Professor of Nature Study

The earthworm is a creature without eyes, with no sense of smell nor organs of hearing, and with no legs nor arms; but the more we study it, the less sorry we are for it and the more we admire the way in which it succeeds despite its natural drawbacks.

First of all, the earthworm does not need eyes because it lives below the surface of the soil, where eyes would be of little use. Neither does it need a sense of smell, because it has to swallow the soil wherever it lives and whatever the odor. Although it has no organs for hearing, it is very sensitive to vibration; this sense is so keen that it knows by the jar of the robin's feet when hopping over the ground that this enemy is approaching, and it squirms down out of reach as rapidly as possible. Neither does it need legs, for these would be in the way. Its method of locomotion is most excellent for a burrower. On the underside of its body there is on each of the segments, except the first three and the last, a double row of bristles, which project backward — that is, in an opposite direction from that in which the worm is moving. By stretching out these elastic segments and catching hold of the soil by these bristly hooks, and then contracting the segments, the worm moves fast enough for all its needs.

It would seem at first sight that the earthworm would be very wise indeed if it knew at which end of its body was its head; but the earthworm is not likely to make a mistake in this respect so readily as are we. In fact, it knows much more than we could believe possible of such a lowly creature.

The earthworm has a rather remarkable mouth. The upper lip is extended into a proboscis and is used as an elephant uses his proboscis — for pushing food into the mouth. Inside the mouth is a pharynx, which can be extended or withdrawn; it acts as a suction pump in drawing the food. The earthworm has no teeth, but it manages to eat through the hardest soil. If we bring one into the schoolroom and place it on cabbage or lettuce leaves we can see how it eats.

The earthworm makes for itself a very comfortable burrow, which, opening at the surface of the ground, goes straight down for a distance, then winds about irregularly, and is usually enlarged at the farther end so as to make winter accommodations for several worms. The burrow has to be large enough so that anywhere in it the worm can turn around.

In plugging the mouth of its burrow the earthworm shows much intelligence. When it draws in a triangular leaf it usually seizes the leaf by the apex, never drawing it in by the petiole unless the base is narrower than the apex. When drawing in pine needles it always takes hold of the base, where the needles are jointed.

It is as an agriculturist that we are chiefly interested in the earthworm. Into the earth, sometimes as far as seven or eight feet but usually for twelve to eighteen inches, goes this little tiller of the soil, bringing to the surface the subsoil. The worm breaks up hard soil by grinding it in a gizzard stocked with grains of sand or fine gravel, which act like millstones. The soil that passes through the earthworm's body is thus of a much finer texture than we can produce by raking or harrowing, and to it has also been added lime from the creature's body. Earthworms plant seeds by covering those that lie on the ground with soil from below the surface, and they further benefit growing plants by keeping the soil fine and granular about the roots. Darwin has estimated that in the garden soil in England there are as many as fifty thousand earthworms in an acre, and that the whole superficial layer of vegetable mold passes through their bodies in the course of every few years at the rate of eighteen tons per acre yearly.

This agricultural work of the earthworm has been going on for ages. Rocks have been undermined and the aspect of the landscape has been greatly changed. Several Roman villas in England owe their preservation to this little creature.

The number of segments of its body varies with the age of the earthworm. When the worm is fully grown there is a thick, whitish ring near the end.

The laying of the earthworm's eggs is an interesting performance. A sac-like ring is formed about the body in the front, near the whitish ring just mentioned. This little girdle is gradually worked forward, and as it goes over the head the sac ends snap together enclosing the eggs. These capsules, yellow-brown, shaped like a football, and about the size of a grain of wheat, may be found in the summer in or about manure piles and under stones.

SUGGESTIONS FOR STUDY

The pupils should be impressed with the fact that the earthworm is a creature of the soil and is of much economic importance. It is well to have a terrarium in the schoolroom filled with damp earth. Scatter grass or leaves on top of the soil, put in some earthworms, and let the children see what happens. The soil should be kept moist, for without water the earthworms soon dry up.

COW

(For special study)

New York is a dairy State. In the majority of school districts the study of cows and all that relates to them should be an important part of the work each year. Few subjects present so many interesting phases. Every child from the youngest to the oldest can find something to study and investigate about cows. The younger children can count the cows in the district and find out how many kinds there are. They can help collect materials for a chart of cattle products. The older children can study the proper ways to care for and feed cows, can raise a calf, can keep records of production, can make the Babcock test, and so on.

In this leaflet special emphasis is laid on the importance of discovering whether cows are paying their way. The value of the products of many cows in New York State is less than the cost of their feed. Such cows should be discovered and used for beef, being replaced by those that pay their way. Rural schools may take a hand in this, and besides the great educational value to the boys and girls, there is practical value to the community.

The article on page 71 discusses the keeping of herd records, and the article on page 74 describes in detail how to make the Babcock test. A good many schools have already done work of this kind. Others are urged to try. If the teachers will have the courage to make a beginning, interest and knowledge will grow. The following are statements from two teachers in regard to work with a Babcock test outfit at the school:

I first made a thorough study of the Babcock test outfit at home. A day or so afterward, I took it to school. The children were very much interested. I tried to explain the process, and at the same time I passed a test bottle around among the children, and exhibited the other parts also. We experimented that day with water and oil, just to test their ability to make readings, and to give them some idea of the process. The sixth, seventh, and eighth grades made readings, and the lower grades handled the bottles and watched the rest of us work.

We made a date to bring samples of milk for a test. Many wanted to bring samples, so I chose four to bring milk on Friday and told them how to get a fair sample.

Before Friday I made a test at home for experience. I found that a little practice was necessary to plan the work right.

Later I made a test which aroused some interest. Two men who each kept a Jersey cow, could not agree as to which cow gave the richer milk, so I tested them. I tested two purebred Holsteins for another man who takes great pride in his dairy of that breed. I hurried around from one place to another to get my samples. I saw each cow milked, and I took my samples right from the pail. The Jerseys tested 6.2 per cent and 6 per cent; the Holsteins tested 3.6 per cent and 4 per cent, the 3.6 one gave a large amount.

When Friday came the children were on hand with their bottles of milk. I gave each one who had samples the pipette and told them to measure the samples and put them into the test bottles, which they did very well after some practice.

I let the children do most of the work except handling the acid. One of the boys turned the machine; one girl kept time; and others tested the speed once in a while by counting the revolutions in a minute. I think once we did not keep the sample warm enough during the whirling. After that we had plenty of hot water on hand.

When the samples were ready for reading, each child was in his seat with a sheet of paper ready to set down the readings. Each of us made our own individual reading of each bottle as it was passed along. (The bottles were known by number until after all readings were compared.) Most all the children were allowed to look at the samples. Only the fifth, sixth, seventh, and eighth grades handed in results. Each put his or her results on the board and then we compared. When we made the second test, all agreed on three of the bottles, but on the fourth bottle they disagreed. They were very anxious to find out whose sample went the highest.

When we made the third test one child was not quite fair in getting the sample. He took the last part of the milking which, of course, is richer than the rest. When I took the bottle out of the cup I mistrusted that something was wrong. It was not Jersey milk either and read 9.8 per cent. How the other children looked when it

NEW YORK IS A FOREMOST DAIRY STATE

Experience has proved that only the best cows return a profit to their owners, who should know the yield of each one

was passed! I asked the child about it and he said, " Papa said that he took the strippings and that it wouldn't be a fair test, but he wanted to see what it would do." Now he wants to try a fair one.

I made out a blank form for each child who brought a sample to fill out. It called for owner's name, date of test, name of cow, breed, performer (his own name), per cent, and success. So we have a record of every sample, good or bad. Some went below 3 per cent. Sometimes I was puzzled with a slight variation in the testing of the same cow's milk at different times, although I have been very exact in measuring the samples and handling the acid. I have always had a clear column of fat, which was well separated from the other part by a clear column of water.

It is peculiar that most of my school children are girls. All of the big boys that are not obliged to attend are out working at home.

Our experience with the Babcock milk test was pleasant and profitable. The children, who were so filled with the intention of learning to do something which men thought worth while, gave their undivided attention through a few short lessons, and soon knew the name and use of each part of the outfit, and a little of the metric system. The younger pupils had to have some explanations in percentage.

Several of the class enjoyed giving a scientific flavor to the work by dropping in a few bits from the nomenclature of chemistry and frequent mention of our "chemical laboratory."

A scale of markings to correspond with those on the neck of the test bottles, was put on the blackboard; then the space occupied by the supposed fat was marked off with a colored crayon for the class to read or note.

After the blackboard exercises, we followed the suggestion of adding some oil to each bottle of water. The various readings were made and compared until each child read and noted with accuracy. The step from "fat-on-water" readings to butterfat readings was made with ease.

The embryo chemists are now looking for new worlds to conquer. It is no small matter that children in a country school with one teacher, become so intent with some useful matter that they finish well some prescribed book lessons in order to get time to do the former.

Every day the pupils, some six or eight, maybe only four, practiced the various preliminary exercises together, getting the right speed, making accurate measurements, transferring pipettes of water to the measure and to the bottles, reading the markings, doing little problems, and so forth, and were ready to inform the teacher (who during this time was busy with other work) if she called upon them for certain points. The children were given full permission to converse, yet so strictly did each attend to business that not once was a child recalled from its laboratory.

Surely the lessons in care were profitable — boys are not so likely to drop crayons, erasers, and books after they have been responsible for thin glass bottles. Nor had we any wasted milk. One who handles corrosive acids must be careful; he will later spill less ink. It is well, too, that he clean and put in place what he works with.

I would tire you with a recount of the points made by the drill in accuracy; so many boys are naturally inclined to think near enough is good enough. One has but to employ one of these near-enough paper hangers once, to ever after pay the exact worker, whatever he demands. What of a druggist or a physician?

Our children are given courage by the ability they acquire in doing this and similar work outside the regular routine. In many instances their seniors are forced into a recognition of worth, where perhaps they had too often declared none existed.

The pupils made tests of twenty or more samples of milk, they enjoyed doing the work and added considerably to their vocabulary and to their ability to express themselves, as they did when questioned by some gentlemen who witnessed for the first time a demonstration of the Babcock test.

There are many other lines of study and activity in relation to cows, material for which has been given in previous leaflets. The following list of references indicates the subjects covered and the places where they will be found.

A study of cows, September, 1915, page 104
Rumination in cattle, September, 1915, page 108
Food and care of cows, September, 1915, page 111
The calf, September, 1915, page 114
The distribution of cows, September, 1915, page 120
The beef type and the dairy type, September, 1915, page 121
The colors of cows (breeds), September, 1915, page 123
Scoring and judging dairy cows, September, 1915, page 130
Handling milk, September, 1917, page 85
Grades of milk, September, 1917, page 87
Milk and its constituents, September, 1917, page 92
Butter, September, 1917, page 97
Beef, September, 1917, page 100

KEEPING DAIRY HERD RECORDS

E. S. Savage
Professor of Animal Husbandry

In order to breed a herd of cows intelligently and to select out those that are not paying their way, it is necessary to keep records of production. A simple piece of home work under school direction may be developed so that the children on dairy farms may have a valuable problem, and at the same time obtain results that will be very useful to the parents. Such a plan will help the father, the child, and the teacher to establish points of contact.

To know accurately and completely the cost of producing milk, a set of books must be kept for the farm, but it is not desirable to attempt this at first. The work directed from the school had better be limited in the beginning to simple records of the production of milk and butterfat by each cow in the herd.

The keeping of dairy herd records requires two pieces of equipment — a Babcock test outfit and a spring balance scale that will weigh in pounds and tenths up to thirty pounds. Both of these may be found in many communities, and the owners are usually glad to lend them to the school for limited periods. A number of rural schools now own Babcock testers as a part of their equipment, and probably it would be possible for many others to obtain one if the teacher and pupils showed themselves in earnest over the cow study work. A six-bottle enclosed tester, such as is best for school purposes, can be bought from any reliable dairy supply house at a considerable discount if it is made clear that it is to be used for educational purposes. The list price has been about nine dollars in years past, but it may be higher now. The spring balance will cost from three to four dollars if bought new. A combination arrangement might be worked out whereby each pupil doing the work would have a balance at home, but all could use the tester at school.

Naturally the complete milk record problem would involve keeping a daily record of the milk yielded by each cow at each milking for one year for the whole herd. This is likely to be more of a task than a boy or a girl can successfully undertake, although if the herd is not a large one, and the pupil is interested, it might be done. Of course the problem can be lightened by taking only three or four cows at one time. There would be real value in doing the work well even with one or two. It is best not to reduce the period of the work to less than the whole time during which the cow gives milk (approximately ten months) because the complete record is the only valuable one. Thus, this piece of work is a long-time experience, and the teacher will have to stimulate and encourage

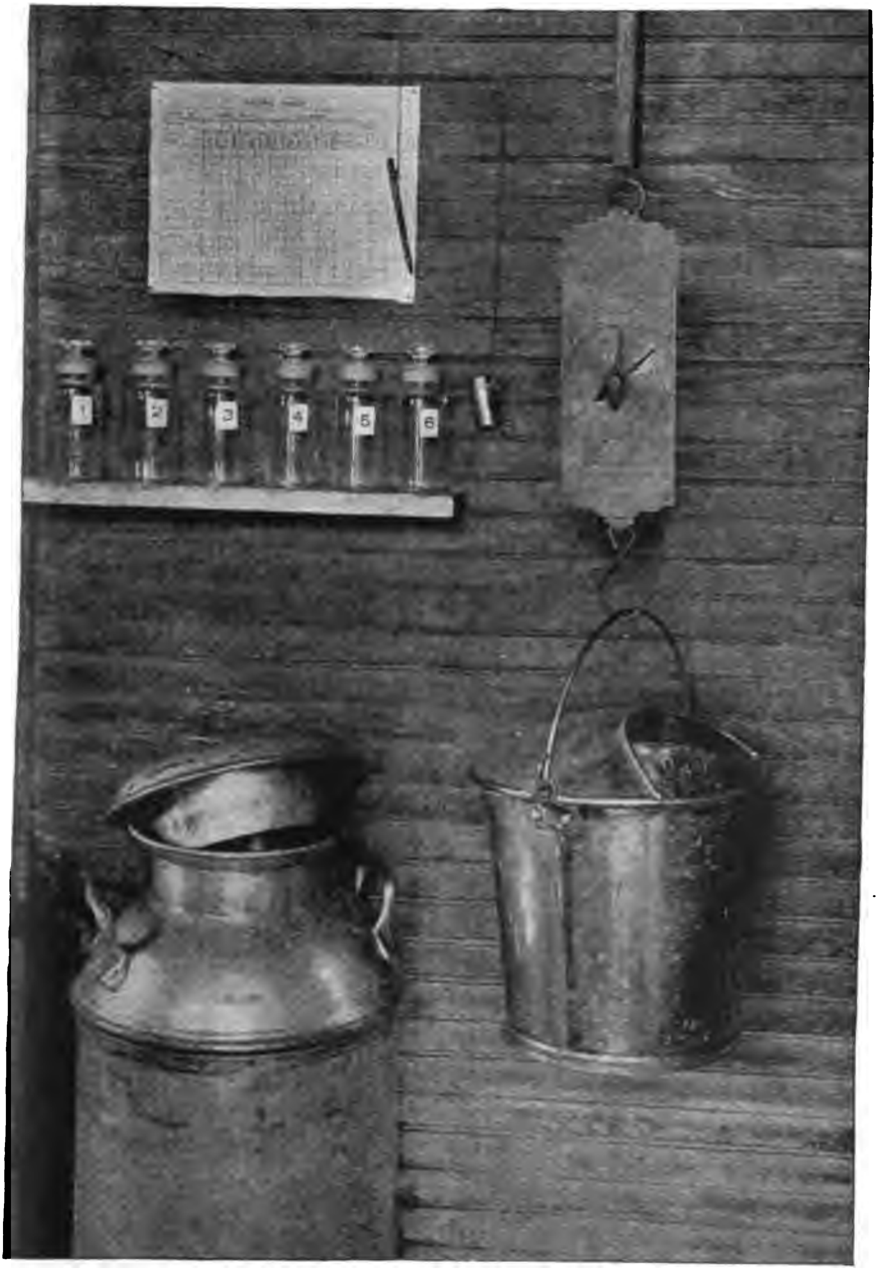
Name of pupil ——————————

Milk record for week beginning ———————19——

Name of cow					
Date		Pounds	Pounds	Pounds	Pounds
	A.M.				
	P.M.				
	A.M.				
	P.M.				
	A.M.				
	P.M.				
	A.M.				
	P.M.				
	A.M.				
	P.M.				
	A.M.				
	P.M.				
	A.M.				
	P.M.				
Total for week					
Per cent fat					
Pounds fat					

Remarks:—

A SIMPLE FORM OF MILK RECORD



MILK WEIGHING AND SAMPLING OUTFIT

the pupil and keep up his interest and enthusiasm so that he will carry it through to the end.

The records may be kept on a sheet that the pupil rules for himself. This sheet should contain all the records for one week. A simple form is given on page 72. As many vertical columns should be provided as there are cows being tested. The total records on these weekly sheets may be posted in a bound book ruled in much the same way, with a page for each cow to show the yearly record. Three columns for each cow are needed for this yearly record, one showing the pounds of milk, one showing the percentage of butterfat, and the other the pounds of fat. There would be a maximum of fifty-two entries for the year in each column.

At the evening milking on one day each week a small sample of the milk from each cow should be taken and a sample of equal size of the milking the next morning. The milk should be thoroughly mixed before taking the sample. These two samples should be kept cool, mixed together, and the combined sample tested for butterfat at school the day the morning sample is taken.

It will be best to plan the work so that the evening sample and the last record for the week will coincide. Then the production of the previous week can be added up on the day that the Babcock test is made. The test is considered as applying to all the milk given by the cow for the preceding week. Multiplying the pounds of milk by the percentage of butterfat indicated by the test, will give the yield of butterfat for the week. For example, one hundred pounds of milk that tested four per cent yielded four pounds of butterfat.

It is safe to say that, at the present prices of feed, any cow four years old or over that is not producing in a year seven thousand pounds of milk testing three and one-half per cent fat, or its equivalent, is not paying much profit. The amount of butterfat is the important thing, and of course the richer the milk is in fat, the less quantity it will be necessary to produce to make a given amount of fat.

THE BABCOCK TEST FOR MILK FAT

H. C. Troy

Professor of Dairy Industry

Pure milk usually contains between three and six per cent of fat. On account of the high value of the fat, the wide variation in amounts naturally present, and the comparative ease with which it may be removed from milk, a practical test for milk fat has become a necessary item in every dairy equipment. Such a test was invented by Dr. S. M. Babcock of Wisconsin and given to the public in 1890.

MILK TESTING OUTFIT

The following equipment is required in making the milk-fat test. It may be bought from a dairy supply house or ordered through a hardware dealer. The sulfuric acid may be bought at most drug stores.

Babcock hand-power centrifuge (a six-bottle enclosed tester is recommended for schools)
Pipette, capacity 17.6 cubic centimeters
Acid measure, capacity 17.5 cubic centimeters
Milk test bottles, six at least
Sulfuric acid, specific gravity 1.82 to 1.83
Hot water

TAKING MILK SAMPLES

Correct sampling is one of the most important parts of milk testing, and when the sample is not truly representative the test is worthless. A fair sample is difficult to obtain because so much care is necessary to reincorporate thoroughly the fat with the milk after the cream has risen. Even fresh milk should be mixed by pouring it from one pail to another or by thorough stirring before the sample is taken. With a sampling tube or dipper four ounces of the milk should immediately be placed in the sample jar. The jar should be stoppered and kept in a cool place until more milk is added or until the milk is tested.

In sampling large masses of milk the principle of mixing is the same, but even greater care should be taken to have the fat evenly distributed throughout the mass.

OPERATING THE TEST

Mix the sample of milk by pouring, allowing it to flow down the side of the vessels to avoid incorporating air bubbles. It should not be shaken vigorously. See that all cream is removed from the sides of the sample bottle and that it is evenly distributed throughout the milk. Then holding the pipette between the thumb and the second finger of the right hand, place its tip well under the surface and draw in the milk by suction with the lips on the upper end until it is filled well above the graduation mark. Quickly place the fleshy pad of the forefinger over the opening and at right angles to the pipette. By rolling the pipette a little between the thumb and the second finger sufficient air will enter to allow the milk to run out slowly until the upper surface is exactly level with the graduation. The pipette should be held perpendicular at this time with the graduation on a level with the eye.

Hold the milk test bottle in a slanting position and place the tip of the pipette into it about one-third of an inch and at a slight angle. Allow the milk to flow slowly down the side of the bottle neck, making certain that none is blown out by the escaping air. Through the pipette blow

the drop that remains at the tip of the pipette into the test bottle. Measure out another test sample in the same manner, as the test must be made in duplicate.

ADDING THE ACID

Fill the measure to the mark with acid. Rotate the test bottle slowly while adding the acid so that it will rinse down any milk remaining in the neck. Immediately mix the acid and the milk thoroughly by whirling the body of the bottle in a circle five or six inches in diameter, using care to keep the mixture out of the neck of the bottle. Shake the mixture vigorously for about one minute after all curd has disappeared, and shake it again just before centrifuging to insure complete solution. The acid unites with all of the milk substances except the fat, thus generating much heat. The temperature of the mixture usually rises to 225° F. Avoid pointing the neck of the bottle toward any person during the mixing operation, and so prevent the possibility of having acid thrown into the eyes or on the clothing. The acid is a strong poison, and if it happens to come in contact with the flesh or the clothing, should be removed at once by washing with large quantities of cold water. Bicarbonate of soda (common baking soda), ammonia, or a similar alkaline substance should be applied to remove any acid not washed away.

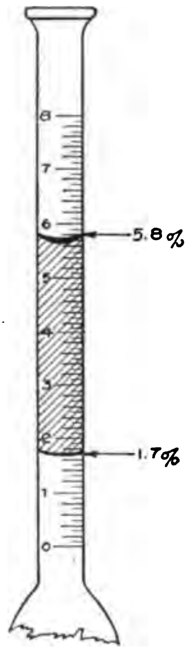
CORRECT POSITION OF THE PIPETTE AND TEST BOTTLE WHILE TRANSFERRING THE MILK

CENTRIFUGING THE BOTTLES

First heat the centrifuge either by placing it on a stove or by adding a few quarts of boiling water. A corked opening in the bottom provides a means of removing the water.

The disk of the machine must be balanced by placing test bottles in exactly opposite pockets. Cover the machine before turning the handle. About eighty revolutions of the handle per minute usually generate one

thousand revolutions, the required speed of the disk. After whirling the bottles for five minutes, stop, and, without removing the bottles from the pockets, fill them nearly to the base of the neck with water that is nearly boiling hot. The pipette or a tin cup with a slender spout may be used for this purpose. Whirl the bottles for two minutes in order to wash any sediment from the fat. Again add hot water to the test bottles until the top of the fat column is a little below the highest graduations on the scale. Whirl the bottles for one minute, and take the readings immediately. If the tests are not read immediately they should be held at a temperature between 130° and 140° F., either by keeping the centrifuge hot and covered or by placing the test bottles in water at that temperature and deep enough to surround the fat columns.



METHOD OF READING THE PERCENTAGE OF FAT IN MILK

The arrows indicate the points on the scale at the ends of the fat column at which the readings should be taken

READING THE PERCENTAGE OF FAT

Subtract the reading on the scale at the base of the fat column from the reading at the highest point at the top of the fat column. The difference is the percentage of fat in the milk. Thus, if the scale at the base of the column reads 1.7 and at the top it reads 5.8, then $5.8 - 1.7 = 4.1$, the percentage of fat in the milk. The curved surface called the meniscus, which always exists at the top of the fat column, must be included in the reading, as it is just large enough to make up for a small amount of fat remaining in the body of the bottle. The limit of error for the test is usually less than .2 of 1 per cent. When such a difference occurs in a duplicate test, the average of the duplicate readings should be taken.

APPEARANCE OF A COMPLETED TEST

In a completed test the fat should be straw-yellow in color; the ends of the fat column should be clearly and sharply defined; the fat should be free from specks and sediment; the water in the neck just below the fat should be clear; and the fat should be in the graduated part of the neck. Some of the defects and remedies are explained in the following paragraphs.

If the fat column is too dark in color, the acid may have been too strong, or too much may have been used, or the temperature of the milk and the acid may have been too high just before mixing. Mixing too slowly might also permit charring of part of the fat. The charred or darkened condition of the fat may be corrected to some extent by using less acid,

by cooling both milk and acid below 60° F. just before mixing, and by rapid, vigorous mixing continued for about a minute after all casein has been dissolved by the acid.

If the fat column is too light in color, the acid was either too weak or too cold. This condition may be corrected to some extent in succeeding tests by using more acid and by having the milk and the acid at a little higher temperature when brought together.

If the acid is not of the correct strength (specific gravity 1.82 to 1.83), it will be difficult to get a correct test, but the trouble may be partly overcome by using more acid when it is weak and less when it is too strong.

SKIMMED MILK TEST BOTTLE

TESTING SKIMMED MILK AND BUTTERMILK

The skimmed milk test bottle is also used in testing buttermilk, and the operation is the same for each substance. The graduated neck of the skimmed milk test bottle has a very small bore in order to measure the fat accurately. A second neck with larger bore is attached to provide a convenient means of filling the bottle. The smallest divisions on the scale usually indicate .01 of 1 per cent, but on some bottles they indicate .05 of 1 per cent.

The same care is necessary in mixing and sampling skimmed milk and buttermilk that is required for whole milk, and the same pipette is used in measuring the sample. The skimmed milk is added to the test bottle through the larger neck. Since a little more acid is necessary to thoroughly free the fat in skimmed milk, the measure should be filled to about a quarter of an inch above the mark. First add about one-half of the acid, and shake the mixture thoroughly; then add the remainder, and again shake it vigorously for about one minute. Avoid throwing undissolved casein into the small neck while mixing the milk with the acid. The bottles are then centrifuged and filled in the same manner as in testing whole milk, except that the first whirling should be continued for ten minutes, instead of five, in order to bring up all the smaller fat globules. The percentage of fat is read immediately on completing the final whirling.

WASHING BABCOCK GLASSWARE

Wash the glassware thoroughly between each test. Any fat remaining in the test bottles would increase the following test. First empty the contents of the test bottles on an ash heap or in some place where the mixture will not come in contact with the food or the feet of animals. Do not empty the mixture into ordinary sinks or drains because the acid solution will destroy the sink and piping. Rinse out the bottles with hot water. Add a strong solution of hot water and good washing powder until the bottles are half full. Shake them vigorously while emptying them, and pass a small brush thru the necks; rinse them again with plenty of hot water. The bottles will then be ready to use in another test.

TRAY AND COVER FOR HOLDING TEST BOTTLES

The pipette should be rinsed with water immediately after measuring out the samples, for if the milk is allowed to dry, it will be difficult to clean the instrument. It should also be washed with hot soap solution when the bottles are being washed, and well rinsed afterward.

A simple tray for holding test bottles while carrying or washing them is made by boring twelve or fourteen holes, to fit the bottoms of the bottles, nearly thru a piece of plank 12 inches long, 6 inches wide, and 1.5 inches thick. A cover half an inch thick is made with corresponding holes. The holes in the cover should be large enough to permit the necks of the bottles to pass through, but not the bodies. Some of the older boys will be interested in making this tray and cover for the school equipment.

When several bottles are to be emptied and washed, they may be placed in the block and the cover placed down over them. By holding the block and the cover together at each end, several bottles may be shaken or emptied as quickly as one.

SPECIAL EXPLANATIONS

While a person may be able to make the Babcock test successfully without knowing all the basic facts on which it depends, a knowledge of them is often of advantage. This applies especially when difficulties are met in getting correct tests or when teachers are explaining the test and answering questions. Therefore a few of the fundamental principles are explained here.

SPECIFIC GRAVITY

When equal volumes of milk and water are weighed, it will be found that the milk is heavier. A vessel that holds 1000 grams of water will hold 1032 grams of average milk; or for each gram of water there would be 1.032 grams of milk. $1032 \div 1000 = 1.032$. Therefore 1.032 equals the specific gravity of milk, since it is the existing ratio between the weights of equal volumes of milk and the standard substance water. One cubic centimeter of water at the proper temperature (4° C., or 39.2° F.) weighs one gram.

THE PIPETTE

The Babcock pipette used in measuring milk test samples delivers 18 grams of milk. $18 \div 1.032$ (the specific gravity of milk) $= 17.44$, the cubic centimeters of milk delivered into the test bottle. The pipette is made to hold 17.6 cubic centimeters because it has been found by experiment that the difference between 17.6 cubic centimeters and 17.44 cubic centimeters, or .16 cubic centimeter, remains in the pipette. The specific gravity of cream varies widely according to the percentage of fat, and cream usually contains air bubbles; therefore when placed in the test bottle, cream must be weighed, not measured with a pipette.

THE MILK TEST BOTTLE

When the Babcock test was first invented, the scale on the neck of each test bottle was graduated to read from 0 to 10 per cent. The smallest graduations indicated .2 of 1 per cent. In recent years preference has been given to a test bottle that has a scale in which the smallest divisions indicate .1 of 1 per cent. The scale on this bottle reads from 0 to 8 per cent. Both forms of bottles are in use at the present time.

The graduated portion of the neck of the 10-per-cent bottle holds 2 cubic centimeters. One cubic centimeter of butterfat at a temperature of 140° F. weighs .9 of a gram. Therefore if the graduated portion of the neck of the milk test bottle were full of fat, it would contain 1.8 grams. That would be 10 per cent of 18 grams. $1.8 \div 18 = .10$. $.1 \times 100 = 10$ per cent. Eighteen grams is the weight of the milk placed in the test bottle. When 2 cubic centimeters, the volume in the neck, is divided into ten equal parts, one part equals one per cent.

ANIMALS TO BE RECOGNIZED IN 1918-1919

SHEEP

E. S. Savage
Professor of Animal Husbandry

ZOOLOGISTS are not agreed as to the exact origin of the native sheep. Whatever their origin, all members of the wild-sheep tribes are mountain- and high-land-loving animals. Our domestic sheep have inherited this peculiarity, preferring cool climates and highlands and open ranges, quickly suffering when closely housed for any length of time.

Our common sheep is a good illustration of the influence of domestication. The modern animal has few characters that would indicate its descent from wild species. Sheep have been under subjection by man from the earliest times. Abraham's wealth was measured by his sheep, oxen, and camels. From the fact that sheep have so long been under domestication in many different countries, it naturally follows that there are many different breeds for different climates, uses, and conditions of environment. The breeds of modern sheep are classified according to their uses, whether for the production of wool or of meat.

The sheep belongs to that large order of quadrupeds known as the *Ruminantia* for the reason that they are all ruminating, or cud-chewing, animals. They have incisors — or front teeth — on the lower jaw only, four stomachs, and cloven hoofs. The incisors on the upper jaw are wanting, being replaced by a hard, tough pad against which the lower front teeth are shut, thus cutting off the grass.

In order to better understand the care, management, and feeding of sheep, it is well to have at least a partial knowledge of the organs of nutrition. The first of these organs are the teeth. They are truly organs of digestion in that they sever the food from its roots when the sheep is grazing, and serve to grind it up and mix it with saliva. This saliva is secreted in the mouth, and aids in digestion.

Sheep have two sets of teeth; first, a temporary set, called the deciduous teeth, meaning those that fall out; and later, a permanent set.

We will study in detail the incisors, or front teeth, only. The temporary incisors come into the mouth within three weeks after birth, and are eight in number. At the end of thirteen to fifteen months after birth, the middle pair of these temporary incisors will have been replaced by a pair of permanent incisors; at the end of two years or a little more, the next two — called the inner middles — will be in place; and then in another year and a half, the last two permanent incisors will have come in, and the sheep will be four and one-half to five years of age. The molars, or grinders, or back teeth as they are called, come in somewhat regular order, filling the back parts of the jaws in about the same time; all the molars are in place and all in wear at the end of five years.

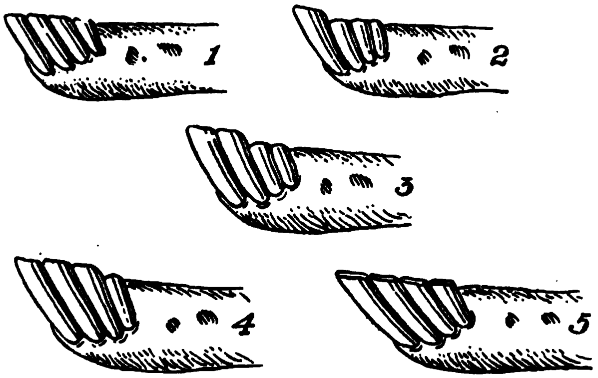


DIAGRAM OF LEFT HALF OF THE LOWER JAW OF A SHEEP AT DIFFERENT AGES

1, Lower jaw of a lamb; all baby teeth. 2, Lower jaw of a yearling; one pair of baby teeth has been replaced by a pair of larger and longer permanent incisors. 3, Lower jaw of a sheep two years old; two pairs of permanent incisors have developed. 4, Lower jaw of a sheep three years old; three pairs of permanent incisors have developed, leaving one baby tooth on each side. 5, Lower jaw of a sheep four years old; all permanent teeth

The lips of the sheep are peculiar in construction and take an important part in the gathering of the food. The upper lip has no muzzle such as is seen on cattle (the broad patch on the upper lip which is provided with an excretory apparatus, and which we may recognize by the beads of perspiration that stand on a cow's upper lip in hot weather). Instead, the sheep's upper lip is divided in the middle by a fissure, which allows either part to be moved independently. This construction of teeth and lips, coupled with the small size of the animal, enables sheep to graze land much more closely than can cattle.

After the food has been partly masticated it passes down through the gullet, or esophagus, into the first of the four stomachs, called the rumen. If we remember the order to which sheep belong, *Ruminantia*, we shall have no trouble in remembering the name of the first stomach. Here the food is somewhat softened by the warmth and moisture, and is formed into long pellets. Later, when the sheep "chews its cud" these are forced back into the gullet and thence into the mouth. There they are thoroughly masticated and reswallowed. This time the food does not stop at the opening into the rumen, but passes on

into the third stomach. The opening into the rumen from the esophageal canal is merely a slit, which probably opens and closes automatically and does not respond to the food after its remastication. The food, on its way to the third stomach, passes the opening into the second stomach, or reticulum. The reticulum serves as an aid to the rumen. It is usually full of liquid, and may serve as a storage place for water for immediate use, much as in the well-known case of the camel.

The third stomach is known as the omasum, or, commonly, the "many-plies," because of the large number of "leaves" that make up its lining. Here the food gets its final squeezing and grinding, until it is sufficiently worked over and disintegrated to be acted on by the gastric juice of the fourth stomach.

This last compartment is the true stomach, corresponding to the single stomach in the horse or in man. It is called the abomasum. Here the gastric juice is formed and true digestion takes place. The food now receives its final disintegration and the nutritive parts are dissolved, ready to be absorbed by the villi of the intestines.

The intestines are made up of a long tube which is doubled many times upon itself. The internal coat of these organs is covered with thousands of minute absorbent vessels called villi. This coat is a network of blood-vessels and so-called lacteals, resembling the close pile of velvet. The food passes through these organs where the villi pick out the nutritive part and pass it into the blood; the blood takes the nutriment to those parts of the body in which it is most needed.

From the above facts we see that the construction of the digestive tract is not only interesting to the shepherd but instructive also. He should have as thorough knowledge of this construction as possible, for it is in these parts of the body of the sheep that most of the mishaps and ordinary diseases arise.

It would seem that these peculiar organs must have been designed especially for these shy creatures, which seem to have little or no means of defense and which seems to be legitimate prey of larger and fiercer animals. With its large pouch for carrying undigested food, the sheep can graze at night or at short intervals during the day, then retire to its coverts and chew and digest at its leisure.

Sheep do not seem to have an overabundance of intelligence and are shy, weak creatures. Therefore they should be handled carefully and easily. The flocking habit is very strong with them and is one of the habits which help in their management on the large open ranges. With the aid of dogs, large flocks can be easily worked from place to place, the dogs guiding the flocks and keeping the stragglers hemmed in.

Sheep are excellent grazers, and the grazing habits of their early ancestors are still to be clearly seen in the domestic strains. They

still prefer the highlands and open places, although in some countries the different breeds have been accustomed to different kinds of country so that we now have breeds that develop and grow well on lowlands. Sheep are accustomed from their origin to eat herbage of greater variety than do cattle; hence by taking advantage of this habit we can use them to clean up weedy and run-out farms and graze down coarse lands on which cattle cannot thrive.

SHEEP RAISING IN NEW YORK

According to the census taken by the New York State Food Commission in February, 1918, there are in New York about 500,000 sheep, of which

HILL PASTURE SUITABLE FOR SHEEP

A considerable portion of the average New York farm is rough land and often not accessible nor suitable for use by stock other than sheep

350,000 are breeding ewes. Few persons realize to what extent the sheep industry of this State has declined. Records show that in 1835 Dutchess, Otsego, and Washington Counties had considerably over 200,000 sheep each, and about twenty other counties had 100,000 each. The sheep industry at that time was on a wool basis; to-day it is not safe to go into sheep raising for wool alone.

The conditions that caused the decline of the sheep industry in New York State have largely disappeared, and other conditions have developed. When the vast ranges of the West were opened up, this State could not compete with a region that offered such favorable conditions for economic sheep and wool production; therefore most farmers in this State went out of the business. Sheep are very often the forerunners of civilization, occupying the borders and frontiers when such exist.

Now the western ranges are being constantly curtailed. The open range is passing. Western sheepmen are buying and oftentimes fencing in ranges. One company in Arizona bought every alternate section in nine townships. Such operations are of course expensive and add to the selling price of sheep and wool. Coincident with the settlement of the open ranges has come from cities an increasingly extensive demand for tender lamb. Americans are gradually becoming a lamb-eating people. They do not like sheep; they demand tender lamb.

What is to be the source of the future supply of wool and mutton, is the question that arises from a consideration of these facts. The answer that at this time seems most logical, is that the farm flocks of the farming States will be looked to more and more as a supply factor in the sheep and wool trade. Therefore at this time of urgent need for food and wool, the farm flocks deserve more attention than ever before.

New York by reason of its location is a great dairy State and always will be. The sheep industry in this State can never regain its former importance, but there is room for many more farm flocks of sheep, kept as a side line to the general farming scheme without interfering with other livestock.

The idea of sheep as scavengers has been overworked, but it is a fact that a small flock of sheep can be kept with little outlay of cash. A flock of sheep renders a distinct service in helping to keep fence corners clean and to enrich the soil. The purchase of a flock of sheep has been the means of rehabilitating many run-down farms infested with weeds and brush. Sheep also aid in solving the fresh meat problem on the farm. They return two dividends a year, food and wool, and the wool should pay for their upkeep throughout the year.

We need more sheepmen of the old type — men who like sheep and who enjoy caring for them when prices are high or low. Sheep have been so scarce in this State for the past few years that not many men of the younger generation have had experience with them. Generally the best sheepmen are those who became interested early in life; therefore it is important to get boys interested in owning a few breeding ewes. Banks and other institutions have taken up this work of making better future stockmen out of the boys. When a clothing establishment in Champaign County, Illinois, wished to place five thousand ewes among the young people of that county, representatives were sent to B. F. Harris, a banker-farmer of Illinois, to ask him if he would be willing to lend to the boy or the girl money with which to buy the ewes if the father endorsed the note. Mr. Harris said, " No. I want the boy or the girl to come into the bank and bring his or her father along, and then I want to lend the money to that boy or to that girl on his or her own note so that the child will know that the banker is trusting him, trusting his honor."

Beginners in sheep husbandry often make the mistake of overconfining and overhousing their flocks. In fact there is more danger of overhousing than of underhousing. A shed open to the south into which the sheep can go during bad weather is practically all the shelter that is needed unless lambing takes place during the winter. In that case warm quarters for lambing must be provided. A newborn lamb is easily chilled, but after it is a few days of age, it can stand considerable cold weather. Overconfined ewes come to lambing time in poor thrift, with loosened wool, and with little milk. The lambs are weak and lack vitality generally.

Winter management of a flock of breeding ewes should take into account the three following points: first, maintenance of the vigor of the ewe;

SHEEPMEN IN THE MAKING

The best sheepmen are usually those who became interested in sheep husbandry early in life

second, development of the unborn lamb; third, growth of a marketable fleece of good quality. In order to accomplish this, the feed should be plentiful and should contain considerable proteinaceous material, such as leguminous hays, bran, oats, and oil cake, and succulent material, such as roots or silage. A mixture consisting of two parts whole oats and one part wheat bran is an excellent feed for ewes. The addition of a small proportion of linseed oil cake, pea size, will make it still better. The value of buckwheat as a feed for ewes is often underestimated. A mixture of equal parts of oats and buckwheat is very satisfactory. In case good clover hay and silage are available, the grain feed may be reduced to a minimum until a month or so before lambing time. A daily silage ration of two pounds per ewe may be fed with safety. Of course silage

that is extremely acid or sour or moldy should never be fed to ewes. In addition the ewes need plenty of fresh water, dry footing, and exercise. Cornstalks scattered over the fields at some distance from the barn will encourage exercise, which is second in importance only to good food.

The only correct method of determining whether or not a flock of breeding ewes is thrifty is to handle them. Extremely thin ewes will often appear to be in fair condition, due to their covering of wool, and it is only when they are carefully handled that their lack of flesh is noted.

Summer management of sheep should be conducted with one object uppermost, keeping the flock healthy. Methods of management that will tend to keep sheep in good health are more important than attempts to cure ailing animals. To this end a wise flockmaster furnishes a wide range if possible, changes pasture often, and at weaning time does not turn the ewe lambs he is saving into the old worm-infested pastures but utilizes a patch of rape, a stubble field, or some other lot where sheep have not been running since it was plowed. Special care should be exercised in keeping sheep healthy during the first year of their lives; after that they are more resistant to disease. Good feed is of paramount importance in keeping up the vigor and resistance of breeding ewes. Sheep should have access to salt during both summer and winter. Lambs should be weaned in order that the ewes may gain in flesh before the next breeding season.

There is no rule of thumb by which sheep can be successfully handled. Shepherding ability comes through experience. As is the case with all livestock, the needs of individual animals differ, and it is the " eye of the master " that observes closely enough to understand the requirements of his animals.

WEASELS

ANNA ALLEN WRIGHT

The *small brown weasels*, or Bonaparte's weasels, are dark brown above and white on the under parts in summer, with a black tip to the rather short tail. The winter coat is white except for the terminal third of the tail, which remains black. The males are eleven and one-half inches in length, the females only ten inches. Their food consists mostly of mice, moles, shrews, small birds, and birds' eggs, and insects, chiefly beetles. They have never been known to attack poultry or the larger mammals. In character they are inquisitive and not especially wary. They allow a person to approach within a few feet before they run for shelter, but if a person makes a squeaking noise they will stick their heads out of some hole or opening so as to investigate. They are ever on the alert and disappear instantly if their suspicions are aroused. Their nest

of leaves and herbage is warm and dry, and is usually placed in some hole in a bank, a dry ditch, or a hollow tree. There are four to five young in a litter, and two or three broods a season.

The *New York weasels* are larger than the small brown weasels and are often known as "ermine." In length the males are sixteen inches, the females thirteen inches. Like the smaller weasel, they are dark chocolate-brown above and white underneath. They become white in winter except for the black tip of the tail. The black tip is longer in these weasels, and the tail is also longer in proportion. They have a well-developed scent gland.

Ermine are disagreeable neighbors for the farmer, as they kill for the mere joy of killing, often leaving victims uneaten as they hurry on for more. These tireless hunters follow their prey by scent, and, whenever there is an abundance of game, content themselves with merely sucking the blood or biting into the skull and devouring the brain. In cold weather, however, they often store the uneaten food. They go on long hunts which sometimes last for weeks, and they seek shelter in the several nests that they have along the route. They kill many mice, rats, chipmunks, and squirrels, chasing them long distances overland or through water. They follow them into any retreat, and often seize their prey by the throat. They are fond of ruffed grouse and are very destructive to our domestic fowls, having been known to kill as many as forty in one night. Their white color doubtless protects them in their winter hunting, and the black tip of the tails, holding the attention, distracts from their form as they leap over the ground in their peculiar way. The footprints are in twos, considerably larger than those of a mouse, the hind feet falling exactly in the prints of the fore feet.

The homes of these troublesome animals are under stumps, in hollow roots of old trees, or often in burrows formerly the property of some animal eaten by the weasel. Little is known of their breeding habits, but during the greater part of the year the two sexes are not congenial. There is probably but one litter in a year, numbering five to six young. These are born in early May and remain near the nest during the summer.

SNAILS

ANNA ALLEN WRIGHT

The common snails are interesting forms of animal life for schoolroom observation. The pond snails are found on the vegetation around the sides of a pond or on leaves taken from the bottom. They may be kept in any glass jar filled with water in which there are some aquatic plants, including the green slime found on the surface of ponds. The land snails are plentiful in all limestone regions and can be found in any rather moist

place, under the shelter of loose stones or boulders, or under dead leaves or decaying logs. Some live on leaves or grasses, sedges or shrubbery, particularly near ponds.

The food of all snails consists mostly of the tender parts of some form of plant life, such as leaves of plants. They feed on the algae, which appear as the green slime mentioned above. Snails are most active in the spring, reaching their greatest growth by midsummer. Normally they live but one or two years. In winter they bury themselves in the ground and close their shells with a leathery secretion of mucus. The naked slugs also cover themselves with this secretion.

Two types of shells will be found among the land snails, conical, or turreted, shells (A) and orb shells (B). The latter are nearly flat and are circular, although spirally formed. When startled or inactive, snails

A

B

C

TYPES OF SNAIL SHELLS

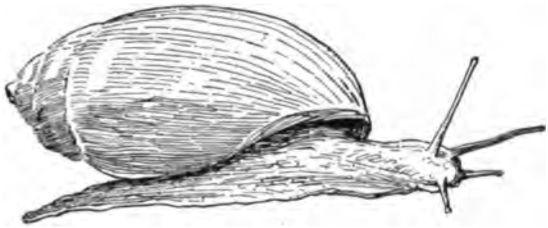
A, conical, or turreted, shell of a land snail; B, orb shell of a land snail; C, conical shell of a pond snail. Pond snails with three types of shells may be found: those with orb shells, those with conical shells spirally wound to the left (C), and those with conical shells spirally wound to the right (A)

withdraw their whole bodies into their shells. The clear, jelly-like masses of their eggs are found under leaves or other vegetation in moist places.

The common slug, often found under boards in our gardens, looks like a snail that has lost its shell; but close observation shows that there is a small, shell-like scale on its back. This scale covers and protects the lungs of the slug. The garden slugs are a great nuisance and destroy many plants. They eat out the heart of celery or the center of a head of lettuce. They may be kept from a small area by surrounding it with ashes, which form a barrier that snails cannot cross.

Three types of pond snails are easily found — those with orb shells, those with conical shells spirally wound to the left (C), and those spirally wound to the right (A). Watching these snails as they travel over the glass sides of an aquarium, one can see them eat the minute green algae growing there. The horny lingual ribbon, with its fine, scraping teeth can be seen in motion. Some of the snails look very strange

as they walk along the under side of the surface film of the water. Their eggs are deposited in clear, jelly-like, almost transparent packets, each containing one hundred to one hundred and fifty eggs. In an aquarium these eggs are often attached to the glass sides, but in the pond they will be found attached to stems or the under sides of leaves.



THE WAY A SNAIL WALKS

The part of the snail that protrudes from the shell, and by means of which it moves about, is known as the "foot." The eyes are on the long tentacles on the forward end of this "foot." The two shorter tentacles aid the snail in its searches

The part of the snail that protrudes from the shell and by means of which it moves about, is known as the "foot." The eyes are borne on the ends of long tentacles on the forward end of this "foot." If the snail is disturbed, these eyes disappear in the inside of the tentacle. Snails have also two shorter tentacles which aid them in their searches. All air-breathing snails have lungs within the mantle that lines the body chamber of the shell. In snails in an aquarium the edge of the mantle can be seen to rise at one point from time to time and release a "bubble of air."

RABBITS

Anna Botsford Comstock
Assistant Professor of Nature Study

In the northeastern United States there is only one common species of rabbit — the gray rabbit, or cottontail. The varying hare, or white rabbit, which was common here fifty years ago, has been practically exterminated. This was one of the most interesting of the species because it changed its coat to white in the winter.

The two most noticeable features in the general appearance of a rabbit are its long ears and its long hind legs. These two characters are closely connected. The long ears are always on the move to catch and locate any sound of danger, and the long hind legs are used to help the little creature go in the opposite direction in mighty leaps. The constantly moving nose probably also has to do with sniffing danger, for it is only through sure flight that these little animals escape from the many enemies that surround them. The rabbits are peculiar also in that the bottoms of their feet are hairy. The front feet cannot be used to hold food to the mouth as is the case with squirrels and mice, but this is not needed as the rabbit eats on the ground.

The cottontail does not dig a burrow, but sometimes occupies the deserted burrow of a woodchuck or a skunk. Its nest is called a form, which means a place beneath a cover of grass or briars, where the grass is beaten down or eaten out for a space large enough for the animal to sit in. The mother makes a soft bed for the young, using grass and her own hair for the purpose; and she constructs a coarse, felted coverlet, under which she tucks her babies with care every time she leaves them. When they are about three weeks old they can run rapidly.

Rabbits have two long gnawing teeth in the front of each jaw. The remaining teeth are broad grinders in the back of the mouth. All rodents except the rabbit have no teeth between the gnawing teeth and the grinding teeth, but rabbits have a small pair of teeth arranged one on each side of the upper long ones. These are left-overs from rabbit ancestors which evidently had four gnawing teeth on each jaw. It is with the front gnawing teeth that the rabbit hurts young trees by girdling them in winter when driven by starvation to feed on the bark. The cleft in the upper lip leaves the gnawing teeth free.

The varieties of rabbits and hares found under domestication are: *Belgian hare*, fawn to red-brown in color, medium size, long and graceful; bred for the market. *Common rabbit*, which may be white (albino), black, maltese, or with broken colors. *Angora*, white or broken-colored; a small to medium breed, with short ears and silky hair; a purely fancy breed. *Lop-eared*, fawn to brown in color; very large ears, which droop; a fancy breed; very tender, requiring artificial heat in winter. *Himalayan*, a small to medium breed; white, with black ears, nose, and feet; short hair; alert and active; a very fancy breed. *Flemish Giant*, very large, weighing fourteen to eighteen pounds; fawn to brown in color; seldom raised.

PHOTOGRAPH BY A. A. ALLEN

A YOUNG COTTONTAIL

VIRGINIA DEER

ANNA ALLEN WRIGHT

Virginia deer are about six feet in length and stand three feet high. Their general color in summer is bright rufous chestnut, with a dark band on the chin and throat; the belly, the underside of the legs, and the underside of the tail are white. The winter covering is coarse and is tinged with gray, or may be very bluish in early fall. The coat is shed twice a year, in June and in September. The change is gradual and does not affect all the parts at once. The antlers, possessed only by the buck, are about twenty-one inches in length and four and three-fourths inches in circumference at the base. They curve outward and upward, the tips turning in toward each other. A short, upright spike is given off near the base, beyond which the beam develops two upright branches, making three nearly equal prongs. In battle the animals approach with bowed heads and the tines meet, shielding each animal from the points of the other. Sometimes the antlers interlock so that the animals cannot separate and as a result may starve. The growth of an antler is very rapid. Starting as a mere button-like growth in the middle of May, it attains its full size by September. It is covered with "velvet," which carries a blood supply until full grown, when the buck rubs the velvet off by scraping his horns on bushes and rock ledges.

VIRGINIA DEER

Virginia deer do not migrate and they have a very small home range. Ordinarily they have a low, smooth, bounding gait, with an occasional high jump. Their footprints are arranged alternately in a double row. The hind foot falls exactly in the mark of the fore foot, which makes an impression about five and one-half inches in length. The two parts of the hoof are very sharply defined and are often unequal in size. Deer are good swimmers.

These animals do not make a nest. The young are born in the middle of May, usually two fawns at a time. The mother hides them in some sheltering underbrush, whither she comes to nurse them. The coat of the young is a rich bay, with clear white spots, which coloring is lost after about four months. These little animals are exceedingly graceful. The males follow the mother for one year, the females for two years. They have many enemies, including bears, wolves, panthers, lynxes, foxes, and eagles.

In summer, deer follow the watercourses, and they feed on herbs, grasses, marsh or aquatic plants, leaves of deciduous trees and shrubs, berries and fruits whenever within reach, and as many beechnuts as can be found. As winter approaches they gather in bands, and when the weather grows severe they congregate in a "yard," which is a cleared, stamped-out space with a wall of snow about it. Here their food consists of buds, low deciduous trees, twigs and foliage of arbor vitae, hemlock, and balsam, and a few mosses and lichens.

ANIMAL QUOTATIONS

COW

"Mooly cow, mooly cow, home from the wood
They sent me to fetch you as fast as I could.
The sun has gone down; it is time to go home.
Mooly cow, mooly cow, why don't you come?
Your udders are full, and the milkmaid is there,
And the children all waiting their supper to share.
I have let the long bars down, — why don't you pass through?"
The mooly cow only said "Moo-o-o!"

From *The Cow-boy's Song*
by MRS. ANNA M. WELLS

SHEEP

Little lamb, who made thee?
Dost thou know who made thee,
Gave thee life, and bid thee feed
By the stream and o'er the mead;
Gave thee clothing of delight,
Softest clothing, woolly, bright;
Gave thee such a tender voice
Making all the vales rejoice;
Little lamb, who made thee?
Dost thou know who made thee?

From *The Lamb*
by WILLIAM BLAKE

WEASEL

The weasel's head is small an' trim,
An' he is leetle an' long an' slim,
An' quick of motion, an' nimble of limb,
  An' ef yeou'll be
  Advised by me
Keep wide awake when ye're ketchin' him!

From *Darius Green and His Flying Machine*
by JOHN TOWNSEND TROWBRIDGE

RABBIT

When the cows come home the milk is coming
Honey's made while the bees are humming;
Duck and drake on the rushy lake,
And the deer live safe in the breezy brake;
And timid, funny, brisk little bunny
Winks his nose, and sits all sunny.

*Funny Little Bunny**
by CHRISTINA G. ROSSETTI

DEER

The antler'd monarch of the waste
Sprung from his heathery couch in haste.
But, ere his fleet career he took,
The dew-drops from his flanks he shook;
Like crested leader proud and high,
Toss'd his beam'd frontlet to the sky;
A moment gazed adown the dale,
A moment snuff'd the tainted gale,
A moment listen'd to the cry
That thicken'd as the chase drew nigh;
Then, as the headmost foes appear'd,
With one brave bound the copse he clear'd,
And, stretching forward free and far,
Sought the wild heaths of Uam-Var.

From *The Lady of the Lake*
by SIR WALTER SCOTT

* From *Poems by Christina G. Rossetti.* Courtesy of Little, Brown and Company.

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INSECT STUDY

THE EDITOR

CHILDREN never cease to marvel at the wonders of the insect world, and teachers should be ready to share their interest and to encourage further study.

The list of insects given for study during the coming year includes the mosquito and the house fly, together with one biting and one sucking insect. It is well for the boys and girls to investigate the life histories and methods of controlling these two serious insect enemies of man. Many valuable lessons in relation to public health and sanitation will result, in addition to the knowledge about the insects themselves. Material is given on the elm leaf-beetle, a typical biting insect, and on the San José scale, a sucking insect. Any other insects may be studied of course.

The list of insects for recognition includes wasp, cabbage butterfly, lady beetle, cankerworm, and horsefly. Of these the wasp and the lady beetle are beneficial, the cabbage butterfly and the cankerworm are injurious to plant life, and the horsefly is injurious to animal life. This list affords a variety of phases and illustrates how wide a field the study of insects covers.

The spider is also given in the list in the syllabus, probably because it could best be included at this point although, of course, the spider is not an insect, there being essential differences in structure.

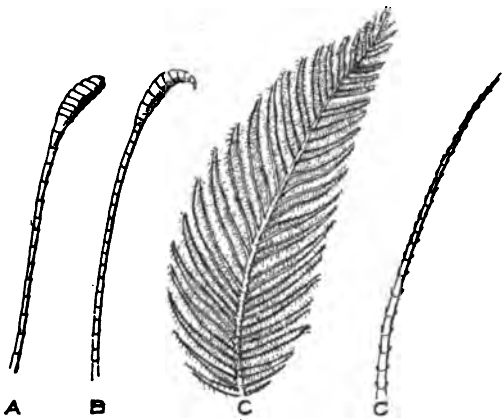
Insect study naturally comes mostly during fall and spring, when first-hand material is available. A terrarium is a valuable schoolroom aid in the study of insect life. It may be made very simply with top and sides of screen and a tight bottom of boards, sometimes with a large, shallow, water-tight pan to hold soil, sod, moss, ferns, rocks, and the like, so that a bit of the out-of-doors is reproduced inside. In such a cage insects of various kinds may be kept for a few days and studied, or some of the moths and butterflies may be watched throughout their life histories.

Some persons are unable to distinguish between a moth and a butterfly. There are very characteristic differences, and a little thought and study will make confusion on this question impossible.

Both moths and butterflies go through the four regular stages of a complete metamorphosis, and in the pupa and adult stages especially are easily distinguishable. The caterpillar of the moth nearly always spins a cocoon in which the pupa is enclosed, or else the pupa develops underground or in some sheltered place, while the pupae of butterflies are always

naked. The adult butterflies fly by day, the wings when at rest are held erect over the back, the body is slender, and the antennae are knobbed on the apex. The adult moths fly by night, the wings are folded flat over the back when at rest, the body is stout, and the antennae are threadlike and feathery, and never knobbed. Occasionally insects will be found that very closely resemble butterflies yet have some characteristics that are similar to those of the moths. They are the skippers, so named because of their peculiar skipping method of flight. The antennae have knobs, but these knobs are drawn out and turned back in the form of hooks. The body is rather stout. The wings are held vertically or horizontally when at rest. The pupa is sometimes covered by a thin cocoon.

Since many insects are serious pests to the farmer, attention should be called to the economic phases of insect study, and to the more general agencies and practices that serve to hold insects in check and to prevent their becoming a scourge. Of course children will be interested in the relation between bird life and insect life, and in the service that birds render in this connection. Likewise, the farm practices of spraying, rotation of crops, and keeping roadsides and hedgerows clean to prevent them from becoming breeding places for insects, should be emphasized.



FEELERS, OR ANTENNAE, OF BUTTERFLIES, SKIPPERS, AND MOTHS

A, butterflies; B, skippers; C, moths. These feelers as here represented are much larger than natural size

Attention is called again to the fact that it is undesirable for schools to make general collections of insects. However, a mount showing the various stages in the life history of some injurious insect is valuable, and a few such mounts might well be prepared during the year. This will serve to maintain the interest of the boys and girls because the different stages can be obtained only at different seasons.

Teachers in the cities are often able to do considerable insect study. There is no reason why the activities of the year should be confined to the insects listed in the syllabus, or why it is vitally necessary that every one of those insects should be covered. The natural opportunities that arise should guide the work to a large extent, but so far as possible those that are indicated for study and recognition by the syllabus should receive attention.

MOSQUITO

(For special study)

GLENN W. HERRICK
Professor of Economic Entomology

Within recent years conclusive proof has been given that some species of mosquitoes carry disease germs from one person to another. For example, the mosquitoes known as *Anopheles* carry malaria germs and another species, which occurs in the warmer parts of the world, inoculates persons with yellow fever. In fact, the only way in which these two diseases are spread from one person to another is through the bites of these tiny insects. Since these discoveries were made, the hum of a mosquito has come to have an entirely new meaning to us. Hitherto our only thought was to kill the insect in order to prevent its annoying us; now we see visions of feverish patients, suffering, and, in many cases, death.

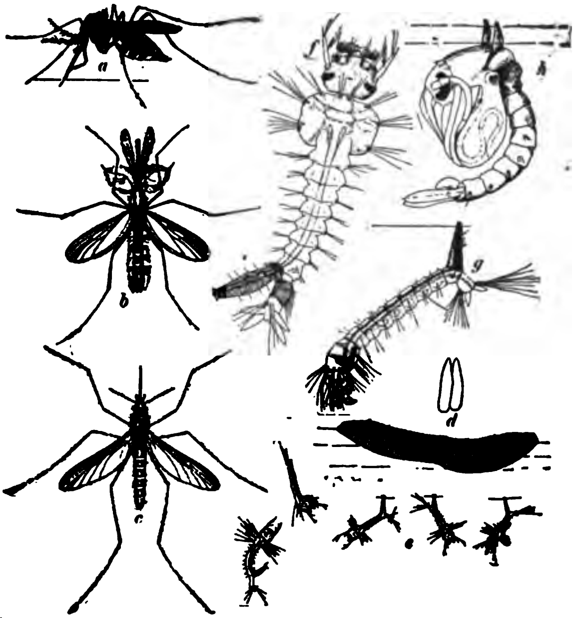


FIG. I. STAGES IN THE LIFE HISTORY OF A CULEX MOSQUITO

a and *c*, females; *b*, male; *d*, eggs; *e*, young "wigglers"; *f*, full-grown larva, or "wiggler"; *g*, larva in feeding position at surface of water; *h*, pupa. All enlarged. (Adapted from Howard)

Many kinds of mosquitoes are found in New York State, but not over a half dozen are at all common about our houses and usually there are not more than two that carry malaria. These two, however, seem to occur everywhere in New York State in sufficient numbers to carry malaria to many persons.

Life history of a common mosquito.— The common house mosquito, *Culex*, lays its eggs in boat-shaped masses (fig. 1, d) on the surface of the water in rain barrels, tin cans, ponds, streams, pools — in fact, on the surface of almost any body of quiet water. The masses of eggs become dark brown and look like specks of soot floating on the water. In from twenty-four

hours to a week, depending on the temperature, the lower end of each egg breaks open and a tiny wriggler — commonly called "wiggler"— or larval mosquito (fig. 1, e and f), comes forth into the water. These wrigglers are very active, and some of them are constantly wriggling through the water. When not in motion they rest quietly just beneath the surface, with a long tube on the end of the body projecting a trifle out of the water. It is through this tube that the tiny wrigglers draw in a supply of air and keep themselves from drowning (fig. 1, g). The body hangs head downward at an angle of about forty-five degrees (fig. 1, g). The wrigglers live in the water for one to two weeks, depending on the temperature and the amount of food. At the end of this time each one changes into a pupa (fig. 1, h). The pupa has a large head and a slender tail, and can also wriggle about in the water. It lies quietly, when not disturbed, just at the surface. In two to five days the skin of the pupa breaks open along the back and the full-grown mosquito crawls out. After drying its wings for a few minutes it flies away in search of some animal from which to suck blood. In the fall the full-grown mosquitoes hide in dark cellars, stables, and other places, where they rest quietly until the following spring.

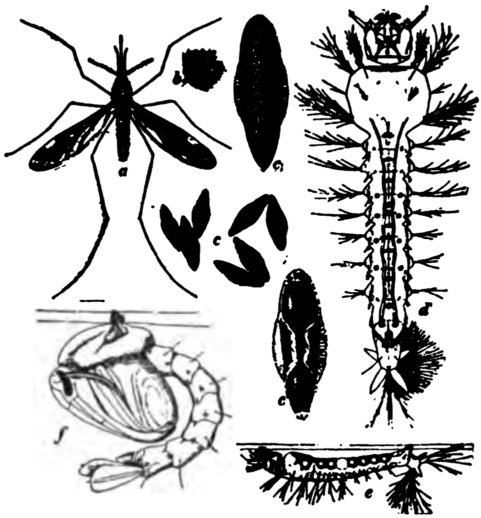


FIG. 2. STAGES IN THE LIFE HISTORY OF AN ANOPHELES MOSQUITO

a, female; *b*, antenna of male; *c*, eggs; *d*, larva, or "wiggler"; *e*, larva in feeding position at surface of water; *f*, pupa. All enlarged. (Adapted from Howard)

Life history of a malarial mosquito.— The malarial mosquito, *Anopheles*, lays its eggs on the surface of water also; but each egg is laid separately, so that the eggs are not in masses glued together although several may be close together on the surface and lie there touching one another. The eggs hatch into wrigglers, but the wrigglers of *Anopheles* lie in a horizontal position just beneath the surface of the water (fig. 2, e). Moreover, when they move they usually wriggle sidewise just under the surface of the water, although they may dive down toward the bottom. The wrigglers live about two weeks and then change to pupae, which resemble those of *Culex*. The full-grown mosquitoes soon appear, thus completing the life cycle in about three weeks.

The *Anopheles* is not so much of a house mosquito as is the *Culex*. The *Anopheles* wrigglers breed farther from the house, along the quiet margins of brooks, ponds, and pools, among the grass and sedges, and in other similar situations. The full-grown mosquito evidently flies a considerable distance, for it seems to find its way easily into houses. It is thought, however, that the malarial mosquitoes will not ordinarily fly more than five or six hundred yards.

Differences between common and malarial mosquitoes.— Only female mosquitoes bite. Male mosquitoes are harmless. They may be distinguished by the hairy appendages borne on the head; the female mosquito does not have these long hairs on the head (fig. 1, c).

The female *Culex* has one long, straight projection from the head, the beak; while the female *Anopheles* has three straight projections from the head, the middle one of which is the beak. The wings of the female *Anopheles* are mottled with dark spots, whereas the wings of *Culex* are plain and clear. When *Culex* rests on the wall the body is held parallel with the surface, but *Anopheles* usually rests with the hind end of the body tipped up at an angle to the surface (fig. 3).

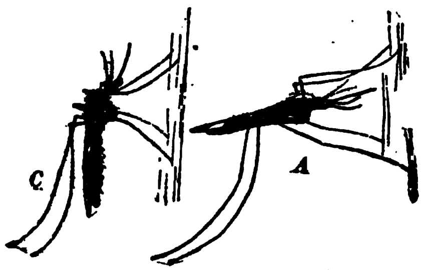


FIG. 3. RESTING POSITIONS OF MOSQUITOES
A, Anopheles; C, Culex. Enlarged. (Adapted from Howard)

Also the wrigglers of *Culex* and *Anopheles* occupy different positions in the water, a fact that has already been pointed out.

The yellow-fever mosquito.— The mosquito that carries yellow fever is found only in the warmer countries. In the United States it occurs in the Southern States at least as far north as Virginia. In past years there have been epidemics of yellow fever in New York City and in Philadelphia, which would seem to indicate that this mosquito has occurred as far north as New York.

The yellow fever mosquito is really very pretty. The legs, thorax, and abdomen are banded with conspicuous silver stripes. The wrigglers are found about houses in rain barrels, tanks, and the like.

The beak and the bite of a mosquito.— All mosquitoes are sucking insects. Each one has a long beak, or proboscis, projecting from the front of the head. Inside the beak are six slender, needle-like organs with which the hole is drilled into the flesh of the person bitten, and the same slender stylets serve as a sort of tube through which the blood is sucked up into the mouth.

Within the body of a mosquito there is a sac containing an irritating fluid. When the mosquito sucks blood, it injects some of this fluid into

the wound made by the beak. As a result there is irritation and sometimes pain from a mosquito bite, varying in intensity with different persons.

Methods of controlling mosquitoes.— The best way to get rid of mosquitoes is to drain or fill up the ponds and pools in which they breed. Old tin cans, pails, and the like, containing water, should be turned bottom side up or drawn far away from houses. Rain barrels and tanks may be covered with wire netting in order to prevent the mosquitoes from laying their eggs on the water.

In many cases ponds and pools that cannot be drained may be sprinkled with kerosene oil every two weeks during the summer. The oil spreads over the water in a thin film and prevents the wrigglers from obtaining air through their breathing tubes. They are consequently drowned. Moreover, the oil kills the eggs and prevents the female mosquitoes from depositing more. In those pools and tanks that cannot be drained or that it is not desirable to cover with oil, certain fishes may be introduced which will destroy the wrigglers.

SUGGESTIONS FOR STUDY

1. Look on the tops of rain barrels and along the quiet margins of brooks for the soot-like egg-boats of mosquitoes. Bring them indoors and place them on water in tumblers or glass jars. Watch the eggs hatch and note the size of the wrigglers when they first come from the eggs. Some of the mud and debris from the pool should be put into the tumbler because in this material the wrigglers will find bits of food.

2. Note whether all the wrigglers are of the same shape and size. The slender ones are the larvae and the ones with big heads are the pupae. Study a larva first. What position does it take in the water? Note the tiny tube that is thrust up to the surface of the water. This is the air tube. What happens when the larvae are disturbed? Do they swim head first or tail first? Do they go to the bottom of the jar when left alone? How do they return to the top?

3. What is the main difference between the larva and the pupa? Where do the pupae rest when not disturbed? Can they move? Note the two little air tubes on the " head," really the thorax, of the pupa. How long does the pupal stage last? When the full-grown mosquito comes forth, how does it get out of the pupal skin? Why does oil on the surface of water kill the larvae and the pupae?

4. How many antennae does the mosquito have? Are these hairy in the female? How are they in the male? On the head of the male are also two other long, hairy appendages, known as *palpi*.

5. Are the wings of the mosquito spotted or plain? If plain, it is probably a common *Culex*. How many wings has it?

HOUSE FLY

(For special study)

GLENN W. HERRICK
Professor of Economic Entomology

Several kinds of flies are often mistaken for house flies. House flies vary in size according to the quantity of food that the maggots obtain and to the temperature surrounding them while they are growing.

The house fly is grayish brown in color, with four dark lines on the thorax just behind the head; and one of the main long veins in each wing turns abruptly upward at the end. The body and the legs are covered with rather long, stiff hairs.

Life history of a house fly.— The small, white, slightly curved eggs are laid among decaying vegetable material, especially horse manure. They hatch in from eight to twenty-four hours or longer into maggots, which reach their full growth in five or six days and change to dark brown objects

LARVA, OR MAGGOT, AND PUPA OF A HOUSE FLY
Much enlarged

known as puparia. The pupae, inside the puparia, rest quietly for about five days, and then transform to the adult flies. There may be six or eight generations each season — each generation, of course, containing more flies than the preceding one.

Injury and control.— House flies are known to be carriers of typhoid fever, cholera, dysentery, and other intestinal diseases, and are therefore very dangerous insects to allow in the house.

All stable manure should be drawn to the fields once a week, or put in a dark, tight room or pit. The closet or outhouse should be tight so that no flies can enter it. The windows to kitchens and other rooms should be screened against flies. They should be caught in traps or on tanglefoot paper, or killed with formalin baits. Two tablespoonfuls of formaldehyde (40 per cent) in a pint of equal parts of milk and water, set about the room in plates, will attract the flies and kill many of them, provided there is no other food or water for them to feed on. A piece of bread placed in the middle of each plate for the flies to alight on will make the bait more attractive. A constant warfare should be maintained against house flies.

ONE BITING AND ONE SUCKING INSECT

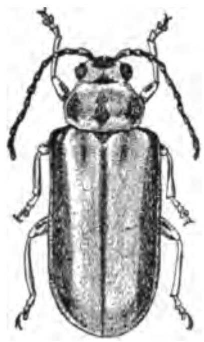
(For special study)

Glenn W. Herrick
Professor of Economic Entomology

NAME OF INSECT	MOUTH PARTS
Elm leaf-beetle	Biting
San José scale	Sucking

ELM LEAF-BEETLE

The elm leaf-beetle is about one-fourth of an inch long. In general it is yellowish or brownish yellow, with a dark line along each side of its back. Its color varies somewhat, and the over-wintering beetles are often so dark-colored that the brownish yellow almost disappears and the black lines are hardly noticeable. It is quite likely to be confused with the common striped cucumber beetle, although it is considerably larger.



AN ADULT ELM LEAF-BEETLE
Much enlarged

Life history of an elm leaf-beetle.— In the fall the full-grown beetles search for nooks and crannies in which to pass the winter, and many of them enter the attics of houses. In spring they fly out to the elm trees that are just coming into leaf. Here they eat round holes through the leaves, and soon lay their orange-colored eggs in varying clusters of five to twenty-five on the under side of the leaves. The eggs hatch in five or six days into the grubs, which eat ravenously and grow very fast, becoming mature in fifteen to twenty days. When full-grown they drop or crawl to the ground at the base of the trunk and change to golden pupae. In six to ten days the pupae transform to adult beetles, which lay eggs for another generation.

Injury and control.— The beetles gnaw holes in the leaves and the grubs eat the leaves so that they curl, wither, and die. In a few seasons the trees will begin to have dead branches and finally may die.

The beetle can be controlled by spraying the trees with arsenate of lead, three pounds to fifty gallons of water. Large trees can be sprayed at a cost of from seventy-five cents to a dollar each.

SAN JOSÉ SCALE

The San José scale is a very small insect about the size of the head of a pin. The body is soft, yellowish white, and wholly hidden beneath a grayish, waxy scale. The scale is circular in outline and somewhat conical in shape with a fine point at the apex often surrounded by a

grayish ring. In fact the scale, when magnified, resembles a small, low, circular mound. It serves as a fine protective covering for the insect beneath. When a peach twig is infested with a multitude of these scales, it looks as though it were covered with a layer of ash-gray scurf.

Life history of a San José scale.— The San José scale passes the winter in a partly grown condition on the branches of the plants that it infests. The scale that covers the body in the winter is dark brown or very nearly black and smaller than when the insect is full-grown. In the spring, when the plant starts growth, the insect grows rapidly and usually becomes mature in June. The young are then produced in great numbers. The young insects look like tiny mites as they crawl about over the branches in search of a place to settle down and insert their tiny beaks into the bark. After a few hours each one settles and begins to secrete its waxy scale. In the course of forty to forty-five days they become full-grown, and another generation is born. There may be two or three generations in New York in a season. The last generation passes the winter on the branches in a partly grown condition.

SAN JOSÉ SCALE

Injury and control.— Each scale insect has a long, slender, thread-like beak, or proboscis, which it thrusts through the bark down to the sappy layers just beneath. It then begins to pump the sap of the tree into its small yet always hungry body. When a tree becomes covered with untold numbers of these tiny insects, they deprive it of all of its nutritious sap and finally literally starve the tree by stealing its food.

The San José scale may be controlled by spraying the infested trees with lime-sulfur during the dormant period, preferably late in the spring just before the buds start. Severely infested trees may need to have two sprayings, one in the autumn after the leaves fall and another in the spring. The spraying should be done thoroughly and with care and intelligence.

INSECTS TO BE RECOGNIZED IN 1918-1919

WASP

ANNA BOTSFORD COMSTOCK
Assistant Professor of Nature Study

The wasps and the bees are near relatives and many unobserving persons do not know them apart. We had some polite neighbors once who came to us and told us apologetically that our bees had swarmed into their kitchen and were helping themselves to preserves that were being made. We hastened to the besieged kitchen and then we had to say apologetically to our nice neighbors that they certainly did not know bees from yellow-jackets, for there were only wasps taking toll of preserves in that kitchen; and yet the honeybees and the yellow-jackets are very unlike. The bee is fuzzy and broad-waisted, while the yellow-jacket is polished and narrow-waisted. However, the feature by which entomologists always distinguish bees from wasps is that the bee is provided with a pollen basket on each of her hind legs, which the wasps lack.

There are many kinds of wasps. In general they belong to two groups, the solitary and the social. The solitary wasps are so called because each family lives by itself; that is, the mother wasp makes a nest for her young in the spring and only the members of one family grow up together. The mud daubers, the mason wasps, the carpenter wasps, and the digger wasps are all solitary. Their wings when closed lie folded across the back.

The mud dauber may be used to illustrate the habits of the solitary wasps. She is a black, slender creature with blue-purple, iridescent wings, and is very common in New York State. She builds her nest of mud, which she finds in puddles and on muddy roadsides. She collects a pellet of mud in her jaws and by mixing it with saliva changes it to cement. She plasters these soft pellets under the roof-boards of some shed or garret. She has to make many trips in building a cell, which needs to be an inch long and perhaps a half inch in width. The walls are about one-eighth of an inch thick; and, while the outside may be rough, the inside is very smooth. When one of these tubes is finished except for an opening left at one end, the mud dauber changes her labors and starts off spider hunting. As soon as she sees a spider hanging snugly in its web she pounces down on it and stings it at just the right place in its nervous system to paralyze it but not to kill it. In her jaws she carries the helpless spider to her nest and packs it into the far end. Then she goes for more spiders until the nest is fairly full; and then she lays her egg in the cell and walls it up, spiders, egg, and all. From the egg hatches a white

grub, for the young of all wasps are grub-like creatures. The little grub starts in at once to eat the helpless spiders and eats heartily, like most young creatures, until it has devoured all the spider meat so miraculously preserved for its use. It then changes to a pupa, and later changes to a wasp and gnaws its way out into the world.

The mason wasps build jug-shaped nests fastened to twigs, and provision them with caterpillars. The digger wasps make holes in the ground for their nests and provision them with caterpillars or grasshoppers. The carpenter wasps excavate tunnels in dead wood or in the pith of shrubs and use various insects for the food of their young. Many solitary wasps use any cavity that they find already made, but they all have this peculiar way of preserving the insect meat fresh for the food of their young. The sting of the solitary wasps gives little pain to man and is very different from the sting of a yellow-jacket.

The social wasps also are made up of many species and include those known as yellow-jackets and hornets — a large species being the white-faced black hornet, much feared even by brave boys. The social wasps fold their wings peculiarly. Each wing is folded lengthwise, like a fan, and extends down each side of the body when at rest, instead of being closed above the back as is the case with the solitary wasps and the bees.

The story of the yellow-jacket will illustrate the habits of all the social wasps. The queen mother survives the winter in some protected place, and in the spring builds a little nest of paper. She bites off bits of wood and chews them into a pulp, and with this material she makes several cells and surrounds them with a protecting envelop. She lays an egg in each cell; these eggs hatch into little white grubs, which she feeds dutifully at first with partially digested food from her own stomach and then with any food that she happens to find which is acceptable to them. Thus they gain their growth and each spins a little veil over its cell, changes to a pupa, and later emerges as a full-grown worker ready for business. These workers at once assume all the duties of the queen except that of laying eggs. They enlarge the nest and feed the young and protect the nest from enemies.

Often one of these wasp nests will show several combs, one below the other. They differ from the combs in a beehive in the following respects: they are made of paper instead of wax; the cells open only on one side, the lower side; they are not used for storing honey, but merely as cradles for the young wasps. It is interesting to see one of these combs with each cell filled to its utmost with a chubby little grub that has a head like a drop of amber honey — a head that is always protruding from the cell in order to attract the attention of the worker nurses when they bring food. One might suppose that hanging head down these legless

creatures would fall out of the nest; but nature has provided each with a sticky disk at the end of the body, and this holds it fast in the cell.

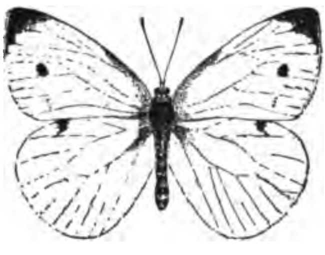
Usually a yellow-jacket's nest is inhabited for one year only. All the inmates die off in the fall except a queen which was developed late in the fall. However, we have heard of one or two instances when a clever young queen took advantage of the old nest and used it for a second summer.

Although wasps are fond of sweets, their chief food consists of insects, and usually the insects that we can best spare, for they destroy many flies, mosquitoes, and injurious caterpillars.

IMPORTED CABBAGE BUTTERFLY

Glenn W. Herrick
Professor of Economic Entomology

The common green cabbage worm is one of the serious pests of cabbages in this country. It is the caterpillar of the white butterfly so often seen fluttering about in numbers over a field of these vegetables. This butterfly is an Old World insect and was probably imported with shipments of cabbages from Europe. It was first noticed in Canada in 1860, and by 1865 it had reached Maine. From there it has spread over the whole United States and has become a much more serious pest than the native cabbage butterfly.



THE IMPORTED CABBAGE BUTTERFLY
Male above, female below

This cabbage pest is a good example of one way in which we are in constant danger of getting new insect enemies. Moreover, it shows how well a pest brought from another country may thrive under the conditions found here.

Appearance of the insect.— The parent butterfly has two pairs of large, strong, white wings. Each of the front wings has a black patch in the outer corner; those of the female bear two black spots in addition and those of the male one black spot. The under sides of the wings are sulfur or straw color. The body of the butterfly is long and slender, and dark in color. Two long, slender feelers, or antennae, project from the head. Each antenna ends in a swollen knob.

On the lower side of the head of the butterfly is a long, slender, thread-like projection coiled up like a tiny watch-spring. This is the sucking tube of the mouth. When uncoiled it is half an inch in length.

The caterpillar is velvety green in color and about one and one-fourth inches in length when full-grown. There is a faint yellow stripe down the middle of the back and a row of yellow spots along each side of the body. The caterpillar eats holes in the leaves of the cabbages and, if abundant, practically devours the leaves.

Life of the imported cabbage butterfly.— The butterflies appear early in the spring, and the mother insect begins to fly about among the cabbages. She flits here and there, resting for a moment now and then on a cabbage leaf. If we examine the place carefully where she has rested, we shall find a small, pale yellow egg stuck to the leaf. In about one week the egg hatches and the tiny green "worm" appears. The caterpillars eat ravenously and grow very fast. They riddle the outer leaves of the plant and many of them crawl down among the tender leaves of the head itself. Here they feed and cause much injury by soiling the tender white leaves. In about two weeks they become full-grown and then change to pupae. The pupa forms a chrysalis, which may vary in color depending somewhat on the color of the object to which it is attached. The chrysalis is attached by a small band of silk around the middle and by a small mass of silk at the pointed, or posterior, end. The chrysalides may be found attached to the under sides of cabbage leaves, boards or palings of a fence, or other convenient objects. During the summer the chrysalis stage lasts one to two weeks. At the end of this time the chrysalis breaks open on the back near the larger end and the butterfly gradually works its way out. After the butterfly has drawn out all its legs and is entirely free from the shell of the chrysalis, it rests quietly while its wings gradually expand and dry; then it flies away.

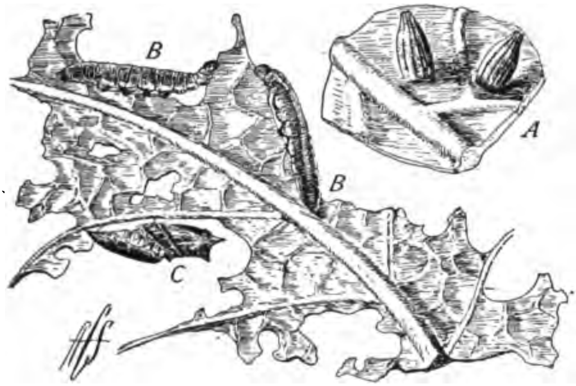
The whole life cycle, from the laying of the egg to the appearance of the butterfly, is passed in from twenty-two days to five weeks. In New York the cabbage butterfly finds time during the summer season for at least three broods. Farther south, where the summers are longer, there must be four or five generations each season.

The cabbage butterfly passes the winter in the chrysalis stage. The last chrysalides formed in the fall, instead of bursting open and giving forth a butterfly, remain unchanged until warm weather of the following spring.

Natural enemies.— The green caterpillars are subject to the attacks of certain tiny, wasp-like, parasitic insects that kill many of them and aid greatly in controlling this cabbage pest. Very often one of the dead green caterpillars is found attached to a cabbage leaf and partially covered by many small white objects, usually considered eggs by those who do not know. As a matter of fact, these are the cocoons of the tiny parasites that

have lived within the body of the caterpillar and killed it. When the parasites are full-grown they leave the caterpillar and spin their small white cocoons on the outside, from which the small, dark-colored, wasp-like parasites emerge in a few days ready to parasitize other cabbage worms. Whenever a lot of these white cocoons are seen about a green caterpillar they should not be destroyed, but should be allowed to remain undisturbed so that the parasites may emerge to work on other "worms."

Methods of control.— This cabbage pest is best controlled by spraying the plants with paris green or arsenate of lead. There is no danger in spraying cabbages with poison up to the time they are half-grown, and even later. A cabbage is only a gigantic bud and grows from the inside outward as does any other bud. The outside leaves never fold up about the head, hence there is little danger of enclosing the poison within the cabbage.



STAGES IN THE LIFE HISTORY OF THE IMPORTED CABBAGE BUTTERFLY

A, eggs; B, caterpillars; C, chrysalis

Paris green should be applied at the rate of one pound to one hundred and fifty gallons of water, or if it is sifted on dry, it should be thoroughly mixed with flour at the rate of one pound to twenty-five pounds of flour. The dry application should be made in the morning while the dew is yet on the cabbage leaves.

Arsenate of lead may be applied at the rate of two and one-half pounds to fifty gallons of water.

The first applications of poison should be made when the "worms" first appear, while the cabbages are young. Other applications should follow as needed. Since the leaves are covered with a waxy coating and shed water readily, it would be of advantage to add a small amount of soap to the arsenate of lead solution to make it adhere to the foliage.

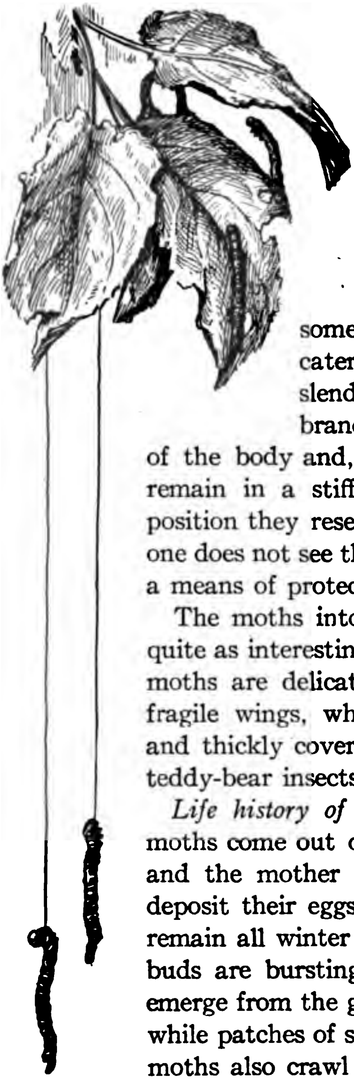
LADY BEETLE

A description of the lady beetle and its habits was given on page 122 of the September 1917 leaflet.

CANKERWORMS

GLENN W. HERRICK
Professor of Economic Entomology

Two kinds of cankerworms are common in the United States, the spring and the fall cankerworm. A cankerworm is a caterpillar that has lost some of the false legs along the middle of the body, leaving only two or three pairs at the hind end. Thus it has not enough legs to enable it to crawl like other caterpillars. Instead it has to use the true legs in front and the few pairs of false legs left on the hind end of the body and move by looping. For this reason cankerworms are called looping caterpillars, or measuring worms, or sometimes spanworms. When disturbed these caterpillars either drop suddenly downward on slender silken threads, or cling tightly to a branch or a leaf with the legs at the hind end of the body and, stretching the body nearly straight out, remain in a stiff, perfectly motionless attitude. In this position they resemble small branches so closely that often one does not see them. This strange habit is thought to be a means of protection from their enemies.



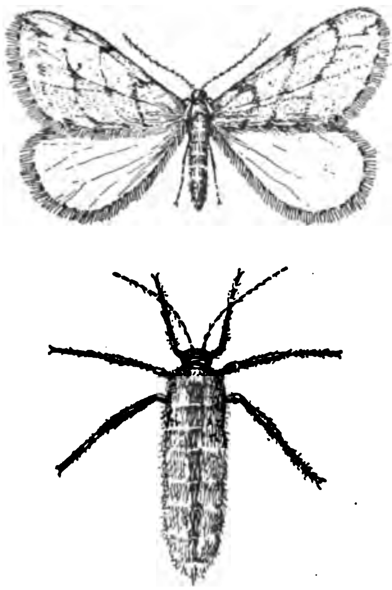
CANKERWORMS

The moths into which these cankerworms transform are quite as interesting as the caterpillars themselves. The male moths are delicate ash-gray or brownish gray with large fragile wings, while the female moths are wingless, stout, and thickly covered with gray scales so that they look like teddy-bear insects.

Life history of the cankerworms.— The fall cankerworm moths come out of the ground in October and November, and the mother moths laboriously climb up the trees and deposit their eggs in bunches on the branches, where they remain all winter and hatch early in the spring, just as the buds are bursting. The moths of the spring cankerworms emerge from the ground early in the spring, often in March while patches of snow are still on the ground. These mother moths also crawl slowly up the trunks of trees, mostly at night, and deposit their pretty, iridescent eggs in crevices of the bark. These eggs hatch about the same time as do those of the fall cankerworms. In fact both species may be found in the same

locality on trees very near together, and each produces the same kind of injury.

The caterpillars devour the leaves with astonishing rapidity and attain their growth in about one month. When they are about one inch long and full-grown, they let themselves down from the branches by slender silken threads and burrow into the ground an inch or more, where they form earthen cells or silken cocoons and change to pupae. The pupae of the fall cankerworms rest quietly until fall, when most of them transform to the moths that emerge from the ground to lay their eggs as already explained. The pupae of the spring cankerworms remain in the ground over winter and transform to moths in the early spring. Fortunately, there is but one generation of these insects each year.



MOTHS OF THE SPRING CANKERWORMS
Male above; female below

Injury and control.— Cankerworms skeletonize the leaves, which soon turn brown, and a badly infested orchard looks as though it had been swept by fire. Of course when trees are stripped of their leaves for several successive seasons, they become very much weakened and many of them die.

Since the mother moths are wingless and have to crawl up the trees to lay their eggs, they may be caught by putting bands of tanglefoot or printer's ink around the trunks of the trees just below the first branches. For fall cankerworms the bands should be put on in October, while for the spring cankerworms they should be put around the trunks in early March or late February.

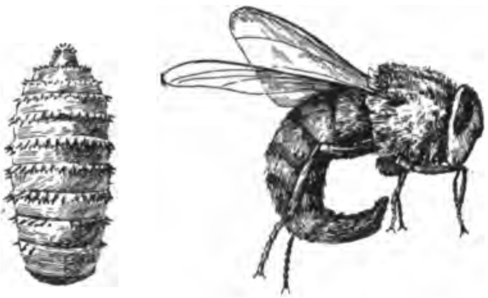
The most effective way of control, however, is to spray thoroughly with arsenate of lead at the rate of six to eight pounds in one hundred gallons of water. The poison should be applied early, while the caterpillars are young and easily killed. The first application to shade trees should be made as soon as the leaves begin to unfold. In the case of apple trees one application should be made before the blossoms open and another just after the petals fall. Since the cankerworms go into the ground to live over winter, many of them may be killed by plowing the infested apple orchards during July, August or September.

COMMON HORSE BOTFLY

GLENN W. HERRICK
Professor of Economic Entomology

There are three kinds of horse botflies in this country, all much alike in general appearance. The common botfly is found all over the world and has been known to scientists for hundreds of years. Even the Greek veterinarians were acquainted with it and with its injuries to horses. Every one who drives and cares for horses knows this fly. It resembles a honeybee in appearance, for its body is hairy and light brown in color. The abdomen, however, is long and slender, and the tip is bent forward under the body ready to deposit an egg and glue it to a hair on the shoulder or the leg of a horse as the fly darts quickly to the horse's body.

Life history of the botfly.— The botflies appear about horses usually in June, and soon their tiny yellowish eggs may be noticed on the fore legs and shoulders of these animals. As the summer progresses the shoulders and legs may become speckled with the many eggs of the flies. Each egg is firmly glued to a hair, and there it remains for several days, or until the horse, in scratching itself with its teeth, wets the egg with saliva, when it immediately hatches and the tiny larva, or maggot, is carried to the mouth by the tongue or the lips. In the course of time the horse swallows the maggots, and each one attaches itself to the inner lining of the horse's stomach. The maggots are known as *bots*. After remaining in the stomach and the alimentary canal of the horse until spring, or probably for about ten months, the bots pass out and burrow a little way into the soil. There each one changes to a quiet brown pupa. In from one and one-half to two months each pupa transforms to a fly, ready in a short time to deposit eggs on the horse.



LARVA, OR BOT, AND ADULT OF THE COMMON HORSE BOTFLY

Injury and control.— The botflies cannot sting, yet they annoy horses greatly by flying about them and depositing their eggs. A horse will stamp and throw up its head, and sometimes very nervous animals will become frantic and try to run away. Apparently these actions of the horse are instinctive attempts to prevent the flies from laying their eggs, because the flies certainly do not bite or sting. The presence of the maggots, or bots, in the stomach of the horse often causes serious interference with digestion and consequent sickness, especially among colts.

The eggs may be destroyed by wetting them with carbolic acid (two per cent phenol) without injury to the horse. Kerosene will not kill the eggs. The bots may be forced to loosen their hold and to leave the horse by dosing with carbon disulfide followed by a cathartic. This treatment should not be given, however, by any one except a competent veterinarian.

SPIDER

A description of spiders and their habits was given on page 131 of the September 1917 leaflet.

INSECT QUOTATIONS

Hurt no living thing:
Ladybird, nor butterfly,
Nor moth with dusty wing,
Nor cricket chirping cheerily,
Nor grasshopper so light of leap,
Nor dancing gnat, nor beetle fat,
Nor harmless worms that creep.

By CHRISTINA G. ROSSETTI

BUTTERFLY

I've watched you now a full half-hour
Self-poised upon that yellow flower;
And, little butterfly! indeed
I know not if you sleep or feed,
How motionless!

From *To a Butterfly*
by WILLIAM WORDSWORTH

MOTH

O voyager of that universe which lies
Between the four walls of this garden fair,—
Whose constellations are the fireflies
That wheel their instant courses everywhere,—
'Mid fairy firmaments wherein one sees
Mimic Bootes and the Pleiades,
Thou steerest like some fairy ship of air.

From *A Twilight Moth*
by MADISON CAWEIN

CHRYSALIS

She brought it in her tiny hand
To see if I would understand,
And wondered when I made reply
" You've found a baby butterfly."
" A butterfly is not like this,"
With doubtful look she answered me,
So then I told her what would be
Some day within the chrysalis.

From *A Chrysalis*
by MARY EMILY BRADLEY

HOUSE FLY

What! here again, indomitable pest!
Thou plagu'st me like a pepper-temper'd sprite;
Thou makest me the butt of all thy spite,
And bitest me, and buzzest as in jest.

From *To a Troublesome Fly*
by THOMAS MACKELLAR

WASP

Here, in the summer, at a broken pane,
The yellow wasps come in, and buzz and build
Among the rafters; wind and snow and rain
All enter, as the seasons are fulfilled.

From *In a Garret*
by ELIZABETH AKERS

SPIDER

" Will you walk into my parlor? "
Said a spider to a fly;
" 'Tis the prettiest little parlor
That ever you did spy.
The way into my parlor
Is up a winding stair
And I have many pretty things
To show you when you're there."
" O no, no," said the little fly,
" To ask me is in vain;
For who goes up your winding stair
Can ne'er come down again."

From *The Spider and the Fly*
by MARY HOWITT

PLANT STUDY

The Editor

PLANT study is almost endless in its variety and relations to the life of man. Under this head are included the weeds and the wild flowers, the cultivated crops, the garden vegetables and herbs, and the garden flowers. Even the smaller children can acquire some knowledge of the wild and cultivated plants that they see every day — a knowledge that will at least enable them to recognize the different kinds, to distinguish their chief characteristics, their relationships, their periods of bloom and fruitage. Boys and girls will gradually see the dependence that animals and men have on the plant world, and they will soon feel the joy of sowing seeds and caring for plants of economic or aesthetic value. The older children can take up the work in more detail and carry it to any desired length, for there are boundless possibilities both in the kinds of plants to be found and in the life history of any particular kind.

As with all nature study, the boys and girls should have actual contact with the plants they study. Ways of accomplishing this are the taking of trips to field or farm, the collection of specimens for mounts and charts or for exhibits, the testing of seeds, the artistic arrangement of flowers, the keeping of spring flower calendars, the making of gardens, and the like.

The syllabus for this year calls for a special study of the radish, but this subject is hardly worth enough in itself to occupy such a position, and, in view of the importance of the garden movement, material on the home vegetable garden is presented instead. Gardening is now recognized as having much educational value. A child properly trained in gardening gains knowledge of natural forces in the most direct way. He forms habits of industry, learns patience and perseverance, learns to meet adversity, develops his reasoning powers, spends hours with useful and beautiful things, has physical exercise under ideal conditions, and at the same time is laying the foundation for delightful and wholesome recreation in later life. The teacher need not be an expert gardener, though a love of growing things is essential. The chief thing is to encourage each child to make a beginning, to persevere, and to study and improve as much as possible. In all of this the teacher grows with the children.

The syllabus calls also for the recognition each year of one clover, one grain, and one grass, and material is given this year on alsike clover, oats, and timothy, all important crop plants common throughout New

York State. These particular plants need not be studied, however, if material on others is more readily available. In every case it would be well to compare the different clovers, grains, and grasses with each other in making a study of any one.

The list of plants for recognition during the year is as follows: jack-in-the-pulpit, peach, nasturtium, honeysuckle, vetch, dogtooth violet, laurel, crocus, pumpkin, celery, iris, and solomon's-seal. Such a list offers a wide variety of wild and cultivated plants, most of which can be found in practically every community. Effort should be made to find and observe as many of these as possible, but the plant study for the year need not be confined to this list by any means. As a fundamental preparation for intelligent discussion of the habits of growth and parts of plants, reference should be made to the article entitled *Helps in the Study of Plants*, on page 215 of the September 1915 leaflet.

Weeds are an important crop in the plant world, and those suggested for study during the coming year are sour dock, ragweed, beggar-ticks, Canada thistle, clotbur. This offers a beginning, but any school that is seriously interested in weed study will recognize many more than these five during the year. Country children especially should realize the importance of weeds from an economic point of view and understand their general habits of growth and the common means of control, in addition to studying these factors particularly for each weed. An article entitled *Weeds* on page 227 of the September 1915 leaflet will be helpful in guiding the weed study.

Many schools are now preparing a collection of wild plants following the instructions given some years ago by Dr. Wiegand. This work is so valuable from many points of view that it has seemed desirable to republish the article entitled *The Collection and Preservation of Specimens of Plants* (page 154).

The school time should never be so filled that there is no opportunity to discuss the coming of the spring flowers, or to talk over the seedtime in autumn. Those who are acquainted with the late summer and autumn woods and waysides, where the fruits of jack-in-the-pulpit, solomon's-seal, and blue cohosh, red rose hips, and witch-hazel blossoms, give rare and rich color, will find abundant material for encouraging out-of-door observation; and, when springtime comes, each day bringing some new blossom on wood or roadside plant, the teacher can do no better work than to open the eyes of the boys and girls to the richness of interest in their out-of-door surroundings.

There is a spiritual quality as well as a mental development that comes from an intimate association with the plant world. Any person who has had a garden understands this.

THE HOME VEGETABLE GARDEN

(For special study)

PAUL WORK
Acting Professor of Vegetable Crops

THE home garden, however small, offers an opportunity to add materially to the resources of the household. At the Illinois Agricultural Experiment Station,[1] a half-acre garden yielded during five years vegetables worth, on the average, $105 a year. A similar trial with a garden fifty by one hundred feet at the Purdue University Agricultural Experiment Station[2] gave products worth $65. Present prices are much above those current when these investigations were made. Even an area two by ten feet is sufficient for radishes and lettuce for May and June and for a half dozen tomato plants later in the season. The garden yields sauce and salad during spring and summer, vegetable food throughout the season, and products for canning and storage for winter use when prices are high. The present popularity of vegetables means for most people a better-balanced diet. Vegetables are rich in body-regulating as well as body-building materials, and their usefulness in adding variety and palatability to the diet is known to every skillful housewife. The superiority of home-grown over purchased vegetables is also well known.

Those who direct the schools now recognize gardening as one of the best educational activities. There is something new to be seen and learned every day. The pupil gains an acquaintance with soil and air and water and plants, that will be a source of pleasure and help to him throughout his years. Moreover, he learns to do a useful thing. He adds to the resources of his life.

Homemade recreation is far better than ready-made. Gardening is an ideal recreation and an ideal hobby. It interests grown-ups for the same reasons that it interests youngsters. It offers good out-of-door

[1] The farmer's vegetable garden. John W. Lloyd. University of Illinois Agricultural Experiment Station. Bulletin 105.
[2] The vegetable garden. J. G. Boyle. Purdue University Agricultural Experiment Station. Bulletin 171.

exercise. When a person becomes a good gardener, he becomes a better man or woman, a better boy or girl.

Gardening in not a rule of thumb business. Each gardener must grow plants in his own way in the light of his own experience and in accordance with the conditions of his own garden. This article is prepared as a guide for the beginner and should serve only for suggestion until experience teaches what is best. A garden lover will speedily learn if his eyes and his mind, as well as his hands, are always busy, no matter how meager his knowledge at the beginning.

MAKING THE BACK YARD WORK

This garden illustrates the fundamental principles, which are applicable in town and country alike. It shows complete utilization of space, succession of crops, large variety, attractive arrangement, and good care.

The beginner should advise with successful gardeners in his community, visit their gardens, and try out the ideas that they find successful. He should read books, bulletins, and articles on gardening. These should not be followed implicitly but are of value as suggesting methods to be adapted to local conditions. A simple diary will be of inestimable value in planning the garden next year.

A garden club, with meetings perhaps once in two weeks, offers opportunity for comparing notes, spreading enthusiasm, and advancing community welfare. No cut and dried plan need be followed, and a few living spirits who have within them the germ of leadership can easily organize the club so that it will best serve the neighborhood.

THE PLACE FOR THE GARDEN

In many cases no choice is available in the location of a garden. Vegetables will grow almost anywhere and in almost any soil, although some are more hardy than others. Most back yards and vacant lots can be utilized even though they have been woefully mistreated. If choice is possible, as where several lots are available or in the case of the farm garden, it is well to bear in mind the following points. The garden should be convenient to the house, so that odd moments may be used for its care and so that its products may be readily available to the housewife. It takes but a few minutes to thin a row of beets, provided the garden is not far away. The distant garden is almost sure to be neglected. An exposure toward the south or southeast is warm and early.

A FOUR-SASH FRAME

Hotbeds and coldframes are useful in early spring for growing crops to maturity and for starting plants to be set outdoors

The garden should not be shaded, but protection from cold winds is desirable. A gentle slope favors good drainage. The best soil is a deep sandy loam made dark in color and light in texture by a large amount of decaying vegetable material, or humus. Very heavy clayey soils are sticky and difficult to work when moist, and are hard and lumpy when dry. They are cold and late in spring. Very sandy soils may be handled when rather wet and are warm and early. They are receptive but not retentive of moisture and fertility. Plant-food should be abundant and available, and soil that has been under good cultivation is preferable.

EQUIPMENT

The equipment for gardening is less costly than that for tennis or golf. The essentials are a spade, a hoe, a rake, and a line. To these may be

added trowel, manure fork, shovel, wheel hoe, seed drill, spray outfit, and other items, after their need becomes evident.

REFORMING BAD SOILS

Many city lots have been filled with clay, and in too many cases bricks, stones, ashes, and garbage have been used. However, such places are seldom unusable. A day's work will remove to the edge of the lot a tremendous quantity of tin cans and rubbish. The transformation that

GARDEN TOOLS

Spading fork, flat trowel, and weeders are useful but not essential

is brought about in this way may be most surprising, and though the soil may not conform to the gardener's ideals, crops may be grown, and his difficulties will make him the more proud of his achievement. Stiff clays may be improved by the addition of other soil, ashes, sand, or street sweepings. It is sometimes worth while to replace soil bodily. However, drainage, and lime and stable manure in liberal quantities, will work wonders in improving the texture and workability of the soil.

If water stands on the soil for any considerable length of time after a rain, tile drains should be put in. Many soils that are not regarded as

needing drainage are greatly improved in this way. Better aeration, better physical condition, better root growth, better plants result.

Lime serves to bind light soils together and to lighten clay soils. It corrects acidity and frees plant-food. Whatever form of lime is most available should be used. Fifty pounds of quicklime is roughly equivalent to 75 pounds of hydrated, or water-slaked, lime and to 100 pounds of air-slaked lime or ground limestone. Two tons per acre, or 10 pounds per 100 square feet, is a good rate of application for the last form.

SEVERAL FORMS OF WHEEL HOES

PREPARATION OF SOIL

The heavier soils should be plowed or spaded in the fall, but the lighter types may be left until early spring. The alternate freezing and thawing during winter breaks up the lumps and renders the soil earlier and more workable. In the spring it should be worked into fine condition with rake or harrow as soon as it is dry enough. It should never be stirred when muddy, but only when lumps crumble readily. If it becomes too dry, lumps will be hard to crush. The soil should be worked six or eight inches deep at first, and the depth should be gradually increased each succeeding year.

For building up and maintaining the supply of plant-food and humus in the soil, no material nor combination of materials equals stable manure.

If used fresh, it should be applied and turned under in the fall; if well rotted, it may be used in the spring. Forty tons per acre, or 200 pounds per 100 square feet, annually is not too much. If manure is kept a while before using, the heap should be compact and moist to avoid loss of fertilizing substances.

Commercial fertilizers are seldom needed if stable manure is used. They alone will not permanently maintain fertility but must be supplemented with manure or green crops turned under to furnish humus.

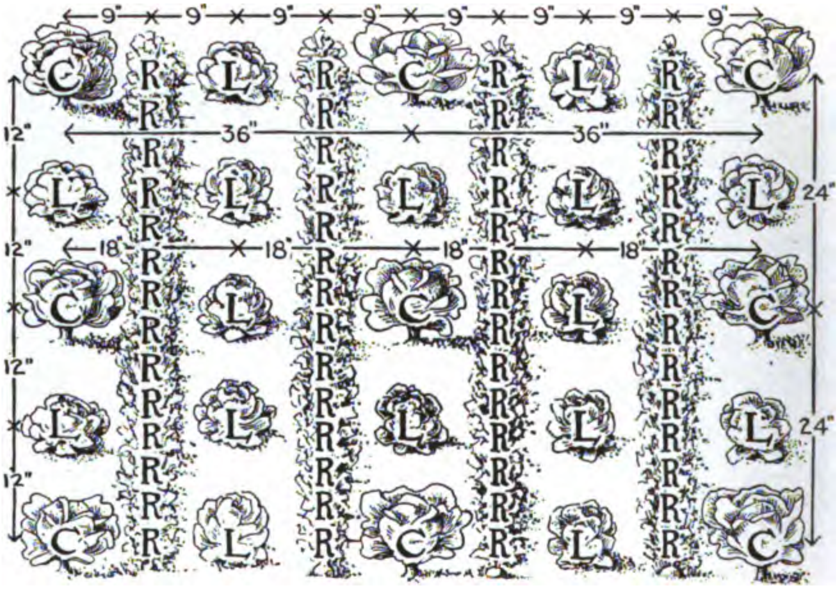


DIAGRAM SHOWING A METHOD OF INTERCROPPING

All these crops are planted at the same time. The lettuce (L) and the radishes (R) mature before they are crowded by the cabbage (C)

PLANNING THE GARDEN

A well-laid plan for a home garden is necessary for best results. Space and effort will thus be saved, and seed, fertilizers, and other supplies may be provided in advance. Before beginning the plan the gardener should know the requirements and seasons of the different crops, the needs of the family to be supplied, and the adaptation of the different crops to the soil and climate involved. The aim should be to produce an abundance of vegetables of high quality in wide variety and as evenly distributed as possible throughout the season. The requirements for canning and storage, as well as for use during the season, should be borne in mind if sufficient space is available.

Most amateur gardeners err in utilizing too large an area. If too large a task is undertaken, the enthusiasm of April is likely to wane under the July sun. It is better to begin on a small scale and let experience teach the best lines of development for later years than to suffer failure and discouragement through an over-ambitious plan.

It is worth while to work out the plan on paper. This serves not only as a guide at planting time, but as a record useful when next year's plan is to be made.

In general the rows should run lengthwise of the plot, especially in the farm garden where a horse cultivator should be used. However,

AN INTERCROPPING SCHEME WITH CAULIFLOWER AND LETTUCE

if the area is very small or there are to be many crops on a moderate area, it may be as well to place the rows crosswise. In this case most of the cultivation will be done with the wheel hoe and the hand hoe.

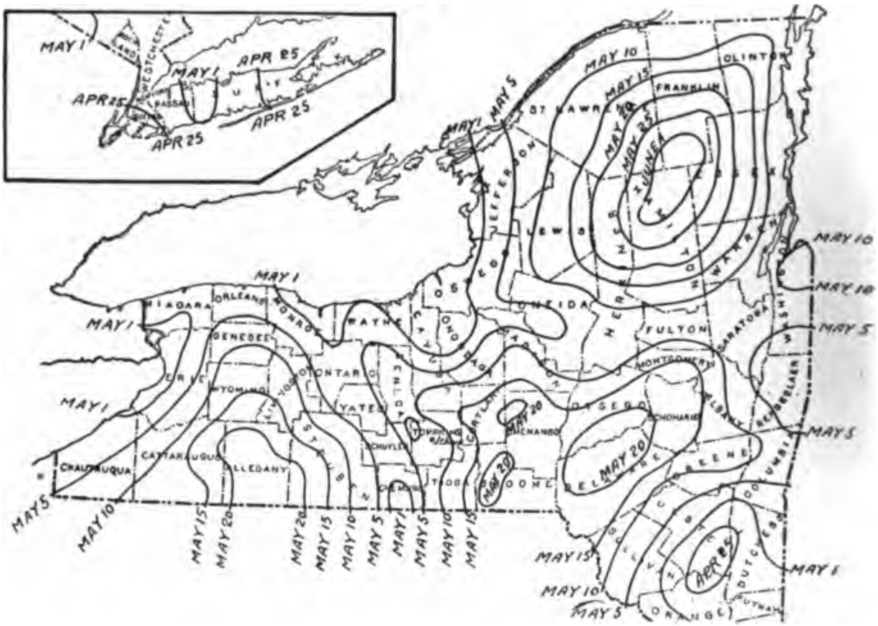
After a person has grown plants a year or two, he will know their habits as to season, size, and form, and he will be able to utilize odds and ends of time and space by intercropping, or planting crops together, and by succession cropping, or planting one crop after another.

Permanent crops and frames should be grouped at one side. Early crops should be planted together in order that the space may be utilized for later planting. The same crops should not be planted in the same place year after year. Attention should be paid to neatness and symmetry of arrangement.

SEED

There are many good seed houses, and it is usually best to order by mail direct. However some local houses that specialize in seeds carry high-grade stocks, and they can offer helpful advice for local conditions. On the other hand, much poor seed, as to both germination and trueness to type, is to be found in grocery and general stores.

One of the most satisfactory sources of seed is one's own garden. A few kinds may be saved with little trouble, and the performance of the best



AVERAGE DATE OF LAST KILLING FROST IN SPRING

plants may be repeated in succeeding years. Selections should be made on the basis of individual plants rather than of individual fruits.

Seed may be tested by planting a given number, for instance fifty, of each kind in a box of soil indoors. The percentage of germination may then be calculated, and the rate of sowing in the garden determined.

It is impossible to state what varieties are best for a particular home garden. This must be learned from neighbors and from experience. For the guidance of the beginner a suggestive list is included on page 126.

PLANTING THE GARDEN

With the soil in thoroughly good shape, the next step is planting the seed. As with other garden operations, it is impossible to lay down definite

rules for sowing seed. The conditions for germination are moisture, warmth, and aeration. A line should be used to make rows straight, and furrows may be opened with a wheel hoe, a hand hoe, the edge of a board, a little stick, or the back of a rake, according to the requirement of the particular vegetable. The seed may be sown from the hand by working it out with the thumb over the second joint of the forefinger. It is almost impossible to scatter seed evenly between the fingers. Another good plan is to cut a small envelop smoothly across the end and shake the seed from it, with an even, steady motion lengthwise of the row. Seed of the smaller and more delicate kinds must be sown more thickly than others, and it should not be covered so deeply. It is also necessary to sow more thickly when the soil is in poor physical

TWO METHODS OF SOWING SEED

Care should be taken to sow seed evenly. It may be sown from the hand by working it out with the thumb over the second joint of the forefinger; or it may be shaken from a small envelop, with an even, steady motion lengthwise of the row

condition or is dry, or if planting is done very early in the season. Commercial gardeners try to know their soil and their seed and to sow just right. It is wise for the home gardener to sow a trifle thickly and later thin out surplus seedlings. On the other hand, too thick sowing involves unnecessary and tedious labor, as well as weak seedlings. A table is included on page 126, which will serve as a rough guide until experience takes its place. The seed should be covered with a hoe or the back of a rake and the soil firmed moderately. In very dry weather, the furrows should be made deeper than usual and the soil firmed with the feet to insure close contact.

In the larger gardens, a drill is a great labor saver. Considerable care, however, is necessary in adjusting it so that it will sow seed evenly and at the proper rate. The scale on the machine serves only as a general guide, and trial must be made to be sure that the rate is correct.

PLANTING TABLE FOR A HOME VEGETABLE GARDEN

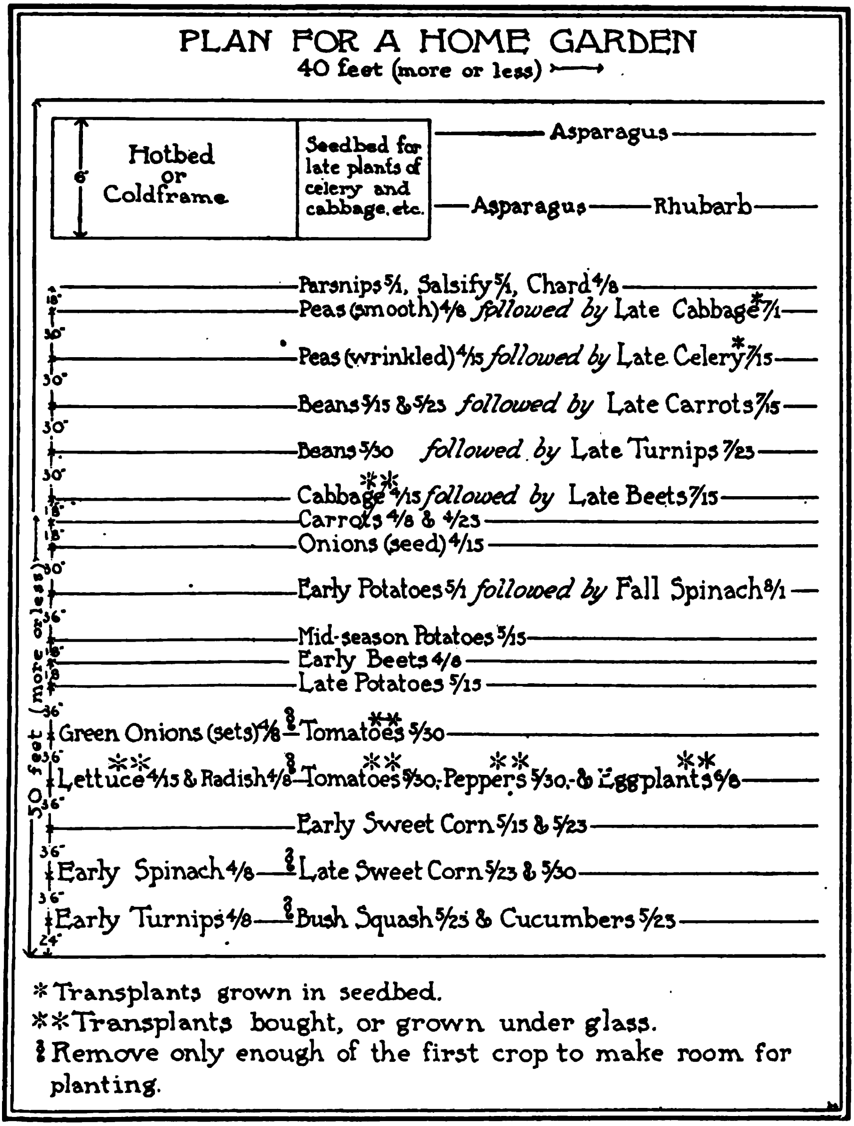
	Varieties	Hardiness	Time to first maturity (days)	Distance between plants (inches)	Distance between rows (inches)	Number of seeds to sow per foot	Amount of seed to buy for 100 feet of row	Depth to plant (inches)
Beet	Crosby Egyptian, Detroit	H	40 [3]– 90	2 – 4	12–30	20–40	1 ounce	½–1
Carrot	Danvers, Short Horn	H	60 –100	2 – 4	12–30	30–60	½ ounce	½–1
Parsnip	Guernsey	VH	120 –150	3 – 4	18–36	20–40	1 ounce	½–1
Radish	Early Scarlet Globe, Icicle, Crystal Forcing	H	25 – 40	1 – 2	6–15	30–60	1 ounce	½–1
Salsify	Sandwich Island	VH	120 –150	2 – 3	18–36	20–40	1 ounce	½–1
Turnip	Milan, White Egg, Swede	H	50 – 90	2 – 4	12–30	30–60	½ ounce	½–1
Potato	Irish Cobbler, Rural New-Yorker	T	80 –140	14 –18	30–36	1 piece	1 peck	3–4
Onion, green	Sets	H	25 – 40	1 – 2	8–15	8–15	1–2 quarts	1
Onion, mature	Southport Globe, Prizetaker	H	100 [3]–140	2 – 4	15–30	20–40	½ ounce	½–1
Cabbage, early	Copenhagen Market, All Head Early	H	60 [3]–110 [5]	12 –18	21–36	[5]	1 packet	¼–½ [6]
Cabbage, late	Danish Ballhead	H	90 [3]–130 [5]	18 –24	30–36	[5]	1 packet	¼–½ [6]
Cauliflower	Snowball	H	70 [3]–100 [5]	15 –24	21–36	[5]	1 packet	¼–½ [6]
Spinach	Long Standing, Bloomsdale	H–VH	30 – 60	2 – 4	12–30	20–40	1 ounce	½–1
Lettuce, leaf	Grand Rapids	H	30 [3]– 70	3 – 8	10–15	[5] or 25	¼ ounce	¼–1
Lettuce, head	Mignonette, Salamander, Hanson	H	40 [3]– 90	6 –15	10–15	[5] or 20	¼ ounce	¼–½ [6]
Celery	Golden Self-blanching	H	70 [3]–100 [5]	4 – 6	24–48 [1]	[5]	1 packet	⅛–¼ [6]
Beans	Refugee, Davis White Wax	T	60 – 80	2 – 5	24–36	10–20	1–2 pints	1–2
Peas	Surprise, Thomas Laxton, Telephone	H	50 – 70	½ – 1	24–36	18–30	1–2 pints	1–2
Tomato	Bonny Best, Ponderosa, Stone	T	60 [3]– 90 [5]	18 [2]–48	30–48	[5]	1 packet	....
Eggplant	New York Improved	VT	90 [3]–140 [5]	24 –30	24–36	[5]	1 packet	....
Pepper	Bull Nose, Chinese Giant	VT	90 [3]–120 [5]	18 –30	24–36	[5]	1 packet	....
Cucumber	White Spine	T	65 – 80	12 [3]–36 [4]	42–60	4 [3]–10 [4]	½ ounce	½–1
Watermelon	Coles Early	VT	90 –110	48 [3]–72 [4]	60–84	4 [3]–10 [4]	½ ounce	½–1
Muskmelon	Osage, Netted Gem	VT	90 –110	12 [3]–48 [4]	48–60	4 [3]–10 [4]	½ ounce	½–1
Squash, early	White Bush, Crookneck	T	65 – 80	30 –48	42–60	4 [3]–10 [4]	½ ounce	½–1
Squash, late	Hubbard, Boston Marrow	T	70 –100	18 [3]–72 [4]	60–84	4 [3]–10 [4]	½–1 ounce	½–1
Sweet corn	Golden Bantam, Crosby, Evergreen	T	70 –100	18 [3]–36 [4]	30–42	4 – 8 [4]	½–¾ pint	1–2

[1] For earth blanching. [2] For single stem training. [3] For single plants. [4] Hills of 3 or 4 plants. [5] From transplants. [6] In seedbed.

This table must not be regarded as infallible for all conditions. It is intended only as a rough guide until experience teaches better. Varieties must be chosen according to taste, climate, soil, and other conditions. Sorts in addition to those mentioned should be tried.

Data regarding hardiness are adapted from Extension Circular 53, Pennsylvania State College, School of Agriculture and Experiment Station. In this column the abbreviations have the following meaning: VH, very hardy, stands hard freezing; H, hardy, stands frost; T, tender, killed by frost; VT, very tender, injured by cool weather.

In the column headed "Amount of seed to buy for 100 feet of row," the quantities indicated are ample for ordinary conditions. In some cases there may be a decided surplus, which may be saved for some other time.



A SUGGESTIVE PLAN FOR THE BEGINNER

The gardener should not try to use this plan as it is, but should make one to meet his own needs and conditions. Too much should not be attempted the first year. This garden is planned for food rather than for fancy. If space is limited, potatoes, corn, and one row each of peas and beans may be omitted as yielding least in proportion to space and labor. For horse cultivation no spaces should be less than thirty inches. Experienced gardeners may plant many intercrops and so use the land more fully. Dates, 4/8, 4/15, and so on, are only relative. They are about right where the average date of the last killing frost is in the first week of May. Plantings near New York City and on Long Island may begin earlier and in highland counties later

EARLY PLANTS AND TRANSPLANTING

It is possible to steal a march on the season and on the neighbors by setting plants as soon as outdoor conditions permit instead of sowing seed. Such plants may be bought from neighboring gardens or may be started indoors or in a hotbed, and " hardened off " in the coldframe. Setting plants in the garden instead of sowing seed also economizes space and, if well done, results in better root systems and larger as well as earlier yields.

Early plants should be stocky, hardy, vigorous, free from disease, and should have good root systems. Relatively low temperature, free ventilation, sparse watering, and abundant sunshine favor these characteristics.

If possible, plants should be set with a block of soil undisturbed about the roots. Tops require pruning only when overgrown, unduly tender, or injured. Water may be used in the hole where the plants are to be set, and the soil should be thoroughly compacted about the roots. Watering the surface is of doubtful value, because it puddles the soil and favors rapid evaporation. In hot weather temporary shade may well be provided for transplants. It is just as necessary that the soil be in good physical condition for transplanting plants as for sowing seed.

LATER CARE

From the time the plants are set or the seed is sown, the surface of the soil should be kept loose in order to save moisture and keep down weeds. With a good soil that has been well manured, hoeing is not a troublesome task, provided it has not been neglected. When the soil becomes hard and weeds get a start, it develops into a real bugbear. Even in a medium-sized garden a wheel hoe, which may be bought for from three to six or eight dollars, is very useful; and in good-sized gardens it may be better to plant closely and work with the wheel hoe and so gain larger yields than would be possible with wide spacing and horse cultivation. This, however, is a question for the individual gardener to solve. A mulch of manure, half-rotted leaves, or lawn rakings may be used instead of cultivation to keep the soil in condition and to conserve moisture. Cultivation and hoeing must be supplemented by hand weeding, and some crops require a good deal of finger work.

WATERING

There is a period in almost every summer when plants suffer for lack of moisture. Water may be sprinkled on the soil with a hose, or may be allowed to flow between the rows. Most hose watering is ineffective because the quantity applied is much smaller than the gardener realizes. It is sufficient only to destroy the surface mulch, is gone in a little while, and serves only to make easy the escape of moisture from the lower levels.

PLANTING THE LARGER SEEDS

Better preparation, shallower furrows, and more careful covering are necessary for the smaller seeds

A thorough watering, equivalent to an all-day rain and applied perhaps once a week, is better than a little sprinkle each day. As soon as the surface is dry enough, it should be stirred and a mulch established.

Very effective overhead sprinklers for garden watering are now obtainable. They consist essentially of pipes in which are set at about three-foot intervals very small nozzles, which yield a gentle rain. With a forty-pound pressure a single line will water a garden fifty feet wide.

What is the best time of day for watering, is a question often asked. In cool weather, early morning is first-rate; in hot weather, evening

OVERHEAD IRRIGATION

is perhaps better. However, commercial gardeners who have to water large areas, do it at almost any time of day. The dangers of injury are not nearly so serious as supposed.

CLEANING UP

The last task in the fall is one that should not be neglected, namely, cleaning up the garden. This is not only a matter of neatness, but of prevention of injury the next year by insects and diseases that winter on or under refuse.

THE ROOT CROPS

The prime requisites in the root crops are smoothness, tenderness, and succulence. Quick growth in a deep, light, and thoroughly enriched soil is necessary. Root crops are all cool-season crops and withstand frost. Plantings may begin as soon as the ground is ready in the spring. Beets, carrots, and turnips may be sown in July for fall storage. Parsnips and salsify require the whole season for their growth.

Beets may be sown at the rate of two to four seed balls to the inch, in rows twelve to thirty inches apart according to means of cultivation. The thinnings may be used for greens. Beets should be thinned at first

to about half an inch apart; when four or five inches high, to an inch apart; and when the bottoms are half an inch in diameter, half may be taken out for immediate use and the rest left to gain full size.

Carrot seed is small and does not germinate very vigorously. The young seedling is delicate and slow in growing. Three to six seeds should be sown to the inch, and the seedlings thinned to three-quarters of an inch apart when about an inch high. When carrots are the size of the thumb, part of them may be pulled and the others left to grow larger. A few radish seeds may be put in the drill with carrots and parsnips to aid in breaking ground and to mark the row for cultivation.

Parsnip seed must be fresh and may be sown a little less thickly than carrot. Seedlings should be thinned to three or four inches apart. Salsify is grown in the same way.

Radishes germinate vigorously, and three or four seeds to an inch are usually sufficient. Rows may be six or more inches apart, and plants thinned to an inch or two apart. Radishes may be used as an intercrop between plants or rows of later and larger vegetables.

Turnips are grown in about the same way as beets since the seed germinates vigorously.

All of these seeds should be covered from one-quarter to three-quarters of an inch, according to soil conditions.

ONIONS

The onion requires a light loose soil full of humus. The earliest green onions are obtained by planting sets of either multipliers or top onions in the fall. These may be protected by a light mulch during the winter and should be planted at the edge of the garden near the perennials. As soon as the ground is ready in the spring, ordinary sets may be placed about an inch apart with the tips just appearing above the surface. The rows may be as close as eight or ten inches.

Mature bulbs for summer and fall use are grown from seed or sets. Seed should be sown in about the same way as that of carrots. After the seedlings are well started, they should be thinned to four to eight to a foot. Sets are started as for green onions, but the space should be increased to two inches apart in rows fifteen inches apart. A considerable amount of handwork is required to keep the soil loose between plants and next to the rows. When the tops die down late in summer, the onions are pulled and, if the weather is good, are left lying in rows for a few days to cure. They may be gathered into crates and should be left in the open air with boards above to protect them from rain, or they may be set in an open shed. They should not be stored for winter until they are thoroughly cured. They may be kept in a cool attic or in a cool dry cellar.

CABBAGE AND ITS COUSINS

CABBAGE, CAULIFLOWER, BRUSSELS SPROUTS, KALE, KOHL-RABI

The crucifers, including cabbage and its relatives, are cool-season crops and may be set out as soon as the ground is ready — about April 15 in most parts of New York State. Cabbage is easily grown on all soils and yields a large bulk of material for the space required. Ample manuring increases the crop in marked degree. For the early crop, plants should be bought from a market gardener, or may be started in a greenhouse, a hotbed, or a kitchen window. The late plants may be started in a corner of the garden, and they need not be transplanted until they go to their permanent place. Early varieties are set from twelve to eighteen inches apart in rows two to three feet apart. The later sorts may be set a little wider. If heads threaten to burst, the roots may be slightly loosened with a spading fork. Cabbage worms may ordinarily be controlled by dusting the plants with hellebore.

Cauliflower requires the same general conditions as cabbage, but it is more difficult to grow. The tender flower bud, which forms the head, is a real delicacy. Cauliflower will not stand so much frost as cabbage and prefers a humid climate. When the flower bud begins to form, the leaves should be tied together to protect the head from light; otherwise it becomes coarse, tough, and dark colored.

Brussels sprouts and kale are grown like cabbage.

Kohl-rabi looks like a turnip above ground. It is very delicate in flavor and is easily grown. It should be planted a bit more thinly than turnips, and the seedlings thinned to four inches apart. It must be harvested while young and tender.

THE POT HERB CROPS, OR GREENS

SPINACH, SWISS CHARD

Spinach may be planted like radishes just as soon as the ground can be prepared in the spring. The young plants should be thinned to about one and one-half to four inches apart. Spinach is difficult to grow in summer, and chard, which is really a leaf beet, may well take its place. The seed is sown in the same way as that of other beets, and the seedlings are thinned at first to about three inches part and later to six. The outer leaves are cut from the plants, and new ones keep coming, so that a supply of greens thruout the summer is assured. These crops are of special value because of the large amount of available iron that they contain.

SALAD CROPS

LETTUCE, ENDIVE, CELERY

Lettuce, especially the heading kinds, demands a soil that is rich in humus. For early maturity, small plants of lettuce may be bought or it

may be started like cabbage, and set in the open ground in rows twelve or more inches apart about six inches apart in the row for leaf varieties, and eight or ten inches part for heading sorts. For later use seed may be sown directly in the open at the rate of two or three seeds to the inch and the young plants thinned to from three to fifteen inches apart, according to the kind. The old-fashioned scheme of sowing lettuce thickly and using the small leaves is liked by some, but the crisp heads or bunches are generally preferred.

Endive is grown like lettuce, and when the plants are eight to twelve inches wide, the leaves are tied together at the top for blanching. The result is a delicate, creamy yellow salad that has slightly more bitter tang than lettuce.

Celery requires humus and an abundance of moisture. The seed is very small and must be covered very lightly in sandy soil. A cloth cover, to be removed as soon as the seed sprouts, is an aid. Celery is difficult to grow well in heavy soils unless they have been well enriched for many years. For the early crop, plants that have been started under glass may be set four to six inches apart in rows twenty-four to thirty-six inches apart. The plants must grow without check; otherwise there is danger of their going to seed. Celery may be blanched by wrapping and loosely tying strips of newspaper twelve inches wide about each head, or by stretching building paper (not tar paper) along the rows, supporting it by means of wire arches, or by setting up ten- or twelve-inch boards very close to the rows. Plants for the late crop are started in an outdoor seedbed and during July are set in rows from three and one-half to four feet apart for earth blanching. Celery may also be blanched in a trench about twelve inches wide and as deep as the plants are high. The heads are lifted with roots on and set as close as they will stand. As severe weather comes on, the tops must be protected by covering them first with straw and later with soil and manure. Ventilation should not be wholly cut off.

LEGUMES

PEAS, BEANS

Peas may be grown in ordinary soils and should be planted shortly after the ground can be prepared. Smooth-seeded sorts may be planted very early, and wrinkled varieties may be used for succession sowings. Rows are placed twenty-four to thirty-six inches part, and the seeds are scattered at the rate of two or three to the inch. They should be covered an inch deep or a little more in soils that are likely to be dry later. Dwarf sorts are best, for they do not require training. If desired, brush or twine supported by stakes may be used.

Garden beans thrive on ordinary good soils. They should be planted a little farther apart than peas after danger of frost injury is past. This

usually means five or six weeks later than the first seeds are sown, although this interval varies greatly in different seasons. Climbing sorts are little used nowadays.

THE TOMATO TRIBE

TOMATO, EGGPLANT, PEPPER

The tomato is one of the most valuable home garden crops. A small area will yield an immense return. Short, stocky, dark-colored plants about six inches high should be grown or bought for setting when danger of frost is past. Some gardeners like to set a few plants a bit earlier than

TRAINING TOMATOES TO A SINGLE STEM

is safe, expecting to replace them if they are nipped by frost. The tomato does well on ordinary soil but appreciates well-rotted manure thoroughly mixed with the soil. Fresh manure is likely to cause overgrowth of vine with little fruit.

If the plants are to run on the ground, they should be set about four feet apart each way. If they are to be trained on stakes, the rows may be three feet apart or even less and the plants as close together as eighteen inches. This is the better plan where space is limited. In this case all side branches should be removed just as soon as they appear in the crotches of the leaves, and the main stem tied to a stake. Care should be taken, however, not to remove flower clusters, which appear on the stem but

not at the leaf axils. The top may be cut off when it reaches a height of five feet. Trained and pruned plants yield a larger quantity of higher quality fruit for a given area, but require considerable care. The soil may be cultivated later in the season, and harvesting is easier.

Eggplants and peppers are grown in much the same way as tomatoes, but are not trained. They may be set in rows three feet apart. The spacing in the row is two feet for eggplants and eighteen inches for peppers.

CUCURBITS

CUCUMBERS, WATERMELONS, MUSKMELONS, PUMPKINS, SQUASH

All cucurbits are easily injured by frost and appreciate an ample supply of well-rotted manure. A forkful of this material may be worked into the soil where each hill is to be. Hills of cucumbers are spaced about three by five feet, and muskmelons a little wider. Bush squash are placed at about the same distance, while late squash, watermelons, and pumpkins require six feet each way or six by eight feet. These distances are for three plants at a place, but several seeds should be sown in each hill and the plants thinned later. Some growers place well-rotted manure underneath trenches instead of in hills, and put individual plants of cucumbers and melons about a foot apart and squash and pumpkins two feet apart, in rows spaced as for the other method. The soil should be kept loose and mellow about the young plants. Contrary to popular belief, there is no danger of crossing these plants, and if there were, the result would not be noticed until the next crop grown from seed. Striped beetles may be controlled by dusting the plants with air-slaked lime early in the morning while the dew is still on.

SWEET CORN

Sweet corn is not fastidious about soil, but appreciates rich, well-manured land. Early corn may be planted with two seeds every eighteen inches, in rows three feet apart. Later sorts require a little wider spacing. The seed should be covered about an inch deep. Little special attention is required beyond good cultivation.

ASPARAGUS AND RHUBARB

Asparagus and rhubarb remain in the garden over winter, the former for an indefinite period. Rhubarb roots ought to be taken up and divided every four or five years. Both appreciate a light soil that has been well enriched with humus and plant-food.

Roots of asparagus may be bought from seedsmen or gardeners, and are planted in trenches eight or ten inches deep, although it is not well to put them down into the subsoil. They should be covered only two inches

deep at first, and the soil may be gradually worked in as the season advances. The shoots should not be harvested the first year after planting, and only a half crop should be taken the year following. The tops are busy after the cutting season is over preparing food material and storing it in the roots for the next year. Thus the plants should be encouraged in every way to make a vigorous top growth, and a heavy coat of manure should be applied each year either in the fall or after the cutting season is ended, about the first of July. Asparagus is spaced about four feet by eighteen inches.

Rhubarb roots are set in trenches about three feet apart each way, with the crown just below the surface of the soil. Rhubarb makes a very vigorous growth the first summer, and stalks may be pulled for use the following year and each year thereafter. It should be heavily manured each year, and seed shoots should be cut off as they appear.

POTATOES

Potatoes prefer a relatively light soil in the best physical condition. They are propagated by pieces of the tuber, from the eyes of which shoots and roots are put out. Pieces should weigh about three ounces, and each should have three good eyes. They are placed about fifteen inches apart in rows three feet apart, and should be covered with about three inches of soil. Potatoes will stand light frost and may be planted two weeks earlier than beans. Many gardeners hill their potatoes in cultivating, but the best practice seems to be level culture until the tubers near maturity, when a little earth may be thrown toward the row to insure proper covering. Before cutting, seed should be soaked for two hours in a solution of corrosive sublimate and water, one ounce to eight gallons. Care must be exercised in using this material as it is a deadly poison. Potato beetles and blight may be controlled by spraying with prepared bordeaux mixture, which may be procured at any seed store.

FREE PUBLICATIONS ON GARDENING

The city and suburban vegetable garden. United States Department of Agriculture. Farmers' bulletin 936.

The farm garden in the north. United States Department of Agriculture. Farmers' bulletin 937.

Hotbeds and cold frames. Cornell reading course for the farm. Lesson 120.

Summer care of the home vegetable garden. Cornell reading course for the farm. Lesson 92.

Control of vegetable diseases. Cornell extension bulletin 19.

ONE CLOVER, ONE GRAIN, AND ONE GRASS, FOR RECOGNITION IN 1918-1919

E. G. MONTGOMERY
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ALSIKE CLOVER

Alsike clover seems to have first come into extensive cultivation in Sweden, in the village of Syke, or Alsike. It was introduced into France about 1800 and into England thirty years later, and probably into America about the same period. It has not been in extensive cultivation for a great length of time; the contrary is true of red clover and white clover, both of which have been cultivated for at least two thousand years.

In June it is possible to find full-grown plants of white, alsike, and red clover. If you cannot study the plants at this time, they should be collected and dried, or, better, preserved in formalin solution, made by adding two ounces of formalin to one gallon of water. This solution may be kept in glass fruit jars and green plants placed in it from time to time. They will keep fresh and green for several months or even years.

On comparing the three clovers it will be found that alsike has leaves resembling those of the white clover, but the general appearance and the stem are more like those of the red clover. Alsike also has smooth stems, as has white clover, but the blossom has more red than does that of white clover and it is larger. In fact the blossom appears to be about halfway between white clover and red clover. Alsike is supposed to be the result of a cross between these two clovers, and it really does partake somewhat of the characteristics of each.

Alsike clover, however, has one important quality that the red and the white do not have. Red clover and white clover will not grow on many soils, which are said to be " acid," until large quantities of lime are added to " sweeten " the soil. The alsike will grow on acid soil, and is found growing well in many places where red clover cannot be grown. Redtop grass also will grow on the same kinds of soil that are suited to alsike; therefore redtop and alsike clover are often sown together for meadow or pasture.

Alsike clover is a valuable feed, either as hay or pasture; but since it does not yield so heavy a crop as does red clover for hay, and is not so long-lived as white clover for pasture, the alsike is not generally sown on land where these other clovers do well. Alsike is especially useful on wet pasture.

SUGGESTIONS FOR STUDY

Make a field survey of the waste lands and roadsides in your neighborhood in early June, when alsike clover is in blossom and most easily recognized, in order to find on what kinds of soil it is growing wild.

How long has alsike clover been cultivated in your neighborhood?

Find out whether there is any land in the neighborhood on which some one has tried to grow red clover and failed. Has he tried alsike clover, and, if so, with what success?

Learn to identify alsike clover before it blossoms, when in blossom, and when the heads are ripe.

Does alsike clover spread by the stems, creeping over the ground? Do white clover and red clover spread in the same way?

Dig up a plant of alsike and see whether you can find any tubercles on the roots.

Get a packet of alsike clover from a seedsman and learn to identify the seed alone or when mixed with other seeds.

OATS

Oats are the most extensively cultivated cereal in New York State. The acreage and the value of oats, as compared with other cereal crops, are shown by the following statistics for 1918:

	Acreage	Value
Oats	1,260,000	$43,394,000
Corn	820,000	51,660,000
Wheat	430,000	16,856,000
Barley	125,000	4,962,000

Only four other States produce a more valuable oat crop than that of New York, namely Illinois, Iowa, Minnesota, and Wisconsin.

OAT HEAD, SIDE PANICLE

About 4.3 acres out of every 100 are devoted to oats in New York. The average yield is 31.3 bushels and the average value is $13.44 per acre. The part of the State showing the highest production of oats is comprised in the counties bordering on the south shore of Lake Ontario, while the east half of the State produces very little oats.

When the shape of the head, or panicle, is considered there are two kinds of oats, known as the true panicle and the side panicle. The oat grain is also of several colors, as white oats, black oats, red oats, yellow oats, and gray oats.

There are several kinds of oat spikelets. Some have only one grain and others have three. In some varieties a long awn is borne on each grain.

Oat grains vary in shape. In some varieties they are long and slender, while in others they are short and plump. There are four hundred kinds of oats.

The oat grain can be separated into two parts, the hull and the kernel. The whole is called a grain. The hull has no food value, but the kernel is very nutritious. In making oatmeal the hull is removed and only the kernel is milled. Oats constitute a valuable food for young growing animals or for horses at hard labor, but they are not used in fattening stock.

OAT HEAD, TRUE PANICLE

The food value of the oat grain depends on the percentage of hull to kernel. About twenty-five per cent of a good oat is hull, but a poor oat grown in a bad season or on poor soil may have as high as forty per cent hull.

Oats usually produce more than one head from a single seed. As the farmers say, the oats "stool," that is, branch at the ground and send up several stems from each seed. When sown thickly, not more than two heads are produced from a seed; but if the seeding is thin and the soil rich, as many as five heads may be produced from a single seed.

SUGGESTIONS FOR STUDY

The oat crop is so important in New York State that the teacher should take opportunity to discuss it whenever interest is shown. Questions that can be answered from the foregoing text will probably lead the girls and boys to think about the subject. Place the questions on the blackboard and have the older pupils consult farmers in the neighborhood and reference books, before answering the questions.

Let one of the pupils place on the blackboard drawings from the illustrations, and find out how many of the class have ever noticed that some oats have true-panicled heads and some side-panicled heads. Appoint a committee of older boys to gather material for the study of oats next year. This will lead to observational work.

In which States do we find oats most extensively grown? How does New York stand in the production of oats? How does your neighborhood compare with other parts of the State in oat production? What is the value in dollars of the oat crop of New York State? In what parts of the State do we find the most extensive oat fields? What percentage of the land in your district is devoted to oat culture, and what is the average yield?

How many kinds of oats are there? How many kinds can you find in your neighborhood next summer?

How many kinds of oat spikelets can you find?

What percentage of a good oat is hull? Determine the percentage of hull in a sample of oats by first weighing a small sample and then removing the hull and weighing again.

Examine oat plants on various kinds of soil and see how many heads are produced to each seed.

Who grows oats most extensively in your district? Is the crop sold or used at home? If oats are not grown in some of the farms in your neighborhood, can you find out why? What effect has the kind of soil on the growing of oats? Do oats require a large or small amount of moisture?

TIMOTHY

The hay crop is the most valuable single crop produced in New York State. Its annual value is about $70,000,000. Altogether there is about five million acres of hay in the State, and about four million acres of this hay is timothy, or timothy and clover mixed. Timothy is therefore the most valuable of all the crops in New York.

The name *timothy* comes from Timothy Hansen, of Maryland, who is said to have introduced the seed from England in 1720. Timothy is sometimes called Herd's grass, after John Herd, who is said to have found it growing wild about 1700.

There are about 1380 species of grass, either wild or cultivated, growing in the United States, yet only a few of these are cultivated to any extent. A grass in order to be cultivated, must have two important qualities: first, it must produce seed in abundance; and second, it must yield a large quantity of good forage. Many of the native wild grasses are excellent in every way, but produce such a small quantity of seed that it cannot be produced at a sufficiently low cost to sow meadows. A few other grasses yield plenty of seed, but the forage is coarse and does not make good feed for cows and horses. Only a few grasses produce both good seed and good forage.

Grasses are known as bunch grasses or sod grasses. Timothy is a sod-forming grass, because each bunch tends to spread every season until bunches near one another intermingle and form a sod.

If you dig up a timothy plant in the fall, a large number of corms will be found; they are swollen parts of the underground stem. These corms give rise to new plants and are important means by which the timothy plant propagates itself from year to year. In fact, the old timothy plants and roots appear to die out more or less every year, and if it were not

for these corms there is some doubt as to whether a timothy meadow would last for more than a year or two.

When the farmer cuts timothy for hay he has two points to consider: first, he must not cut it when too green or when in blossom, or it will make dusty hay; also, the crop increases about one-fourth in weight from the time it is in bloom until it is ripe, so that he does not obtain so large a yield when the hay is cut in blossom. On the other hand, ripe hay is not relished by animals; also, allowing the hay to ripen exhausts the roots and weakens the sod for another crop. The proper time to cut timothy is from seven to ten days after blossoming, when the seed is in the "dough" stage but is not ripe.

SUGGESTIONS FOR STUDY

Find out what proportion of all the land in your school district is in hay; in cultivated crops; in pasture; in forest.

How much of the hay land is pure timothy? How much is timothy and clover mixed?

How many cultivated grasses can you name or collect? How many uncultivated grasses can you find growing wild?

Have you ever seen the corms on a timothy plant?

How much hay per acre is produced in your district?

The average yield of timothy in New York State is 1.1 ton per acre. Compare this with the yield in your neighborhood.

A heavy dressing of manure has often doubled the yield of old meadows. At the Cornell University farm an old meadow yielding 1¼ tons of hay was made to yield 3 tons by applying the following fertilizer per acre: 200 pounds sodium nitrate, 100 pounds acid phosphate, 50 pounds kainit. This is a good fertilizer for most old timothy meadows.

How long does a timothy meadow last?

PLANTS TO BE RECOGNIZED IN 1918-1919

Editor's note.— With the exception of the two vegetables, pumpkin and celery, the material on the following plants has been prepared by K. M. Wiegand, Professor of Botany.

JACK-IN-THE-PULPIT

Jack-in-the-pulpit is found in rich woodlands where the soil is not too dry. Below ground there is a bulb-like or tuber-like corm about the size of an English walnut, hence the name Indian turnip. If tasted the corm creates an intense burning sensation in the mouth, which at first is not apparent but soon becomes almost intolerable. This is probably due to the needle-like crystals of oxalate of lime contained in the tissue

of the corm. Above ground the jack-in-the-pulpit has a fleshy stem bearing toward the top one or two compound leaves of three ovate sharp-pointed entire-margined leaflets, and a most peculiar terminal flower cluster. The latter consists of a large funnel-shaped bract, which at the top is arched over so as to form a roof to the funnel. Inside this strange structure is a club-shaped organ, which is perfectly smooth above but bears tiny flowers at its base. These flowers are very simple in structure being without calyx or corolla. The two sexes are borne on different plants. The peculiar bract, called a spathe, and the club-shaped organ, the spadix, are greenish in color or striped with brown. The fruit consists of a cluster of bright red berries. "Jacks" are known to most country children. We all like them, for they carry the atmosphere of the forest.

PEACH

Material on the peach is given under tree study on page 190.

NASTURTIUM

The nasturtium of the gardener and the nasturtium of the botanist are not the same. The nasturtium of the botanist comprises plants related to the watercress and the horse-radish. The well-known flower of the garden is quite a different plant. It is an annual in this climate, sending up from the curious wrinkled and furrowed "seeds" the peculiar round leaves attached to the petiole at the center of the lower surface. Such leaves are called peltate, or shield-shaped. The flowers are large and showy of an orange or yellow color but sometimes varying to white or dark brown. Some varieties are even pinkish. The five irregular sepals are greenish yellow and fused at the base. From the posterior side projects backward a long spur, or honey tube. The five petals are somewhat irregular in shape and long clawed, that is, provided with a long slender stalk-like base. The three lower have a coarse fringe on the claw. The stamens are eight in number, unequal, with curved declined filaments. The peculiar three-lobed ovary matures into three separate indehiscent portions with grooved surfaces, which are the so-called "seeds" of the florist. Each contains a single seed. Nasturtiums are natives of South America. They are grown as a general utility plant for greenhouse, cut flowers, or bedding. They are much used in vases and window boxes. The fruits have a pleasant cress-like taste.

HONEYSUCKLE

Honeysuckles are of many kinds. Some are shrubby and erect, forming many-branched bushes and are called bush honeysuckles. Others are twining or form extensive tangles on the ground. Among these are the true honeysuckles of Europe and the Japanese honeysuckle. All are

characterized by opposite leaves with entire margins and irregular tubular flowers of various shades of white, pink, lemon yellow, or red. The flowers of the bush species are borne in pairs, and the two fruits are often fused before maturity. Those of the climbing species are borne in head-like clusters. The ovary is inferior in all cases. On its top are borne the calyx of five minute teeth and the irregularly five-lobed corolla varying in the different kinds from open tubular to narrowly cylindrical and curved. The five stamens are inserted on the corolla. The fruit is a red berry. Honeysuckles are often very sweet scented and produce much honey.

HONEYSUCKLE

A red-flowered climbing honeysuckle blooming in July and August. It is closely allied to the coral, or trumpet, honeysuckle, which is native from Connecticut southward

They are visited by humming birds and especially by large night-flying moths. The name honeysuckle has been improperly applied in certain localities to the columbine, which is in no way related to the true honeysuckle and should not be called such. The true honeysuckle is among the best known of the old-fashioned English garden vines. The honeysuckle family includes also the elders, the viburnums, and the twinflower.

VETCH

The vetch is a member of the pea family. It shows its relationship both by the foliage and by its fruit. Vetches are of several kinds, some wild and some found only under cultivation. They are all herbs with

pinnately compound leaves, the leaf axis terminating in a forked tendril. The leaflets are usually small with entire margins and a sharp point. The rather small blue-purple or whitish flowers are borne in dense one-sided spikes or rarely solitary in the axils of the leaves, and are distinctly pea-like in structure. They consist of a five-toothed calyx, a corolla of standard two wings and a keel, ten stamens, nine of which are fused side by side with the tenth free, and a simple one-celled ovary forming a fruit like a pea pod, called a legume. Some vetches are wild in our woodlands, others are weeds by roadsides, while the hairy vetch is now a popular fodder plant.

DOGTOOTH VIOLET

Plant names are not always appropriate. The dogtooth violet is not really a violet at all but a member of the lily family. It is very common around the borders of rich woodlands in New York State. The waxy,

DOGTOOTH VIOLET

mottled, elliptical, sharp-pointed leaves form large colonies in spring and early summer. In earliest spring a slender flower stalk about eight inches high arises from the deeply buried corm. This stalk is usually sheathed at the base by two leaves and terminated by the solitary, showy,

yellow or white lily-like flower. The latter consists, as in the lily, of a six-parted perianth of recurved distinct segments, six stamens and a single pistil. In the three cells of the ovary are many ovules. The fruit is a many-seeded capsule. The dogtooth violet, or adder's-tongue

LAUREL

as it is often called, is one of the early spring flowers, or " may flowers " so dear to children in the springtime after the long winter is over. The name adder's-tongue is suggested by the mottled leaves with the forked tongue-like flower between them.

LAUREL

In the southern portion of New York State and especially in the Catskills, the hills and glens are often one mass of pink bloom in June. Closer inspection shows the flowers to be borne on shrubs with waxy evergreen entire leaves several inches in length, the laurel bushes. Two kinds make up this profusion of flowers, the great laurel, or rhododendron, and the mountain laurel,or kalmia. These flowers have a five-toothed calyx, a five-lobed corolla, ten stamens, and a single pistil consisting of a five-celled ovary with single style and stigma. The capsular fruit contains many minute seeds. The anthers are peculiar, as they open by a pore at the top rather than by a longitudinal slit. In the mountain laurel the anthers are each caught in a little pocket in the corolla. As the flower opens the filaments are forced back until the tension is sufficient so that a light jar or contact with an insect visitor will release the anther, and the stamen

flies toward the style elastically, dusting out the pollen and striking the insect. It is interesting to operate this mechanism with a pin or pencil point. There are one or two other laurels in the State one of which, the sheep laurel, often forms extensive low patches in pasture lands in sterile sandy regions. The leaves are smaller and blunter and the flowers smaller and more purple than those of the mountain laurel. Sheep laurel is poisonous to stock.

CROCUS

No flower is awaited in spring with more interest than the crocus. This is a garden flower brought from the Old World and is not a part of our native flora. Deep in the ground there is a globular or flattened corm, a kind of fleshy tuberous stem, from which in earliest spring arises a solitary funnel-shaped flower to the height of three to six inches. The ovary of this flower is located below the ground and is three celled. From its summit arises the long slender tube of the fused calyx and corolla. This tube enlarges toward the summit and terminates in a six-lobed border of blunt segments. The stamens are three in number inserted near the base of the tube. The remarkably long style extends all the way from the subterranean ovary to the summit of the perianth where it ends in fan-shaped stigmas, which when gathered from a certain species of crocus form the saffron of the druggist. The flowers are later followed by a bunch of very narrow stiff, grass-like, furrowed leaves. The fruit capsule, though at first underground, matures just above the surface. The crocus belongs to the iris family, a fact that would scarcely be suspected without close study.

PUMPKIN

The pumpkin is one of the most interesting vegetables for boys and girls because of its associations with cornfields, jack-o'-lanterns for Hallowe'en, and pies for Thanksgiving. It belongs to the same family as the cucumber, the melons, and the squash, which was in the list for study last year, but is the most luxuriant member and requires such a large space in which to grow that it is usually planted in fields rather than in gardens. The pumpkin vine, blossom, and fruit are good subjects for study and for work in drawing and color. A visit to a cornfield in which pumpkins are growing should result in many lines of outdoor observation.

How many kinds of pumpkins can be found in the neighborhood? What are they used for chiefly? How do pumpkins compare with Hubbard squashes? How are pumpkins kept through the fall and winter? What does the pumpkin seed look like, and how does it start to grow? What enemies has the pumpkin vine? These and many other questions will naturally arise. The subject is full of possibilities.

CELERY

In this country celery is a cultivated garden vegetable, but it comes from a plant that grows wild in Europe. Celery is increasing in popularity and is more generally grown each year, though its production on a large scale is limited to areas where the soil is very rich, moist, and porous, such as well-drained swamp land. The celery plant is a biennial, taking two years to produce seed, and belongs to the same family as carrot, wild carrot, and parsley.

FLOWER AND FRUIT OF PUMPKIN

Wherever possible, growing celery should be studied and the following points emphasized: habit of growth, what kind of soil is best, how the seed is started indoors and the young plants later set in the field in furrows which are gradually filled in as the plants grow, thus producing the long stalk free from leaves; methods of culture; how the stalks are blanched; when celery is dug; how celery is used.

If the children have never seen celery growing, a few plants might be started in the spring and turned over to some boy or girl to grow as a special enterprise during the summer. The other children should keep in touch with all that is done and the product should be exhibited at school in the fall. Keen interest in vegetables can be created by having each child who is old enough take some particular vegetable for special study during a season.

IRIS

The iris, or fleur-de-lis, is a famous old-fashioned garden plant, which in late years has regained its former popularity. In the thirteenth century it became the national flower of France. A wild species of iris in this country is the well-known blue flag. Irises of all kinds are perennial from stout rootstocks. The leaves are long and sword-shaped and at the base overlap each other like a succession of V's, a fact that suggested to the early popular mind a person riding astride, thus leading to the term *equitant* for this leaf condition from the Latin *equus*, a horse. The large

A TURF WALK BORDERED WITH IRIS

showy flowers possess an inferior three-celled ovary, on the summit of which is borne the funnel-shaped perianth tube, which divides above into the three broad reflexed showy sepals and the three somewhat smaller erect incurved petals. The stamens are three in number. The style toward its base is fused with the perianth, but above it divides into three flat petal-like arching branches under which the stamens are sheltered, and under the apices of which are the true stigmas. The fruit is a many seeded capsule. More than one hundred species of iris are in cultivation, but only a few of these are common. In the iris family, besides the true iris here described, are such well-known plants as crocus, gladiolus, and freesia.

SOLOMON'S-SEAL

Early in May solomon's-seal may be found in rich woodlands, and before the end of the month it is in full flower. The plant consists below ground of a long, thick, horizontal rootstock bearing at regular intervals the seal-like scars of the stems of previous years, hence the name. Above ground a solitary arching stem from one to three feet high is produced each year. The alternate leaves are in two vertical rows on the upper part of the stem and are elliptical in shape with parallel veins. The greenish flowers are scattered in small clusters along the stem in the leaf axils. The six perianth parts are fused into a tube inclosing the six stamens and the single three-celled pistil. The fruit is a blue berry produced in midsummer or early autumn. Solomon's-seal is a so-called monocotyledon and belongs to the lily family. Because of superstition connected with the seal-like markings on the rootstock, these plants have long been well known to people in the country. There are two kinds, a smaller few-flowered one with the leaves hairy beneath and a larger several-flowered species with smooth leaves.

WEEDS FOR STUDY IN 1918-1919

K. M. Wiegand
Professor of Botany

SOUR DOCK

Sour dock, or sheep sorrel, is a very common weed in cultivated land and in old meadows; but it is also found by roadsides and in waste places. It is six to fifteen inches high, scarcely ever branched except in the flower cluster, with small arrow-shaped, or halberd-shaped, smooth leaves most abundant near the base. The foliage has a very sour taste. The flowers are very numerous and small, in a terminal open panicle. Since they are pollinated by the wind a showy corolla is not necessary to attract insects, and the flowers are greenish or reddish and very insignificant. The stamens and pistils are found on different plants; therefore the dock is said to be dioecious. There are six perianth, or floral envelope, parts and six long exserted stamens in the staminate flower; and six perianth parts and a one-celled ovary with three fluffy stigmas in the pistillate flower. The stigmas are designed to catch easily the pollen floating about in the air. The fruit is a three-cornered buckwheat-like achene containing a single seed. The presence of sour dock in a field usually denotes poor soil. In grassland improving the fertility is usually sufficient for its eradication. A larger, though otherwise very similar species of this plant, is also called sour dock; however it is much less common.

RAGWEED

Late in summer, roadsides and waste places are often completely covered with a dense growth of ragweed. This plant also often occupies large tracts in poorly seeded meadows and in poorly cultivated fields. It is an annual, springing from seed in the early summer. It is from one to three feet high, much branched, with alternate or opposite pinnately twice-divided or compound leaves with narrow divisions. The staminate flowers are very minute and are borne in small pendent greenish yellow heads in terminal racemes. Each head is surrounded by a cup-shaped involucre, and it is easily seen that the plant belongs to the great composite, or sunflower, family. The pistillate flowers are in pairs, and each pair is inclosed in a woody involucre, which in fruit bears several short wart-like spines at the summit. The pistillate flowers are in the upper leaf axils at the base of the staminate spikes. The fruits are about one-eighth or one-fourth inch long, hard, and woody. Ragweed is the most important cause of autumnal hay fever. Its period of flowering, about August 10 to September 10, is coincident with the most severe period

of hay fever. It is wind pollinated, and the production of large quantities of pollen for this purpose insures a large supply in the air throughout this period. Ragweed should be mowed down before it flowers. Another species, the giant ragweed, inhabits low ground. It is six to eight feet tall and has large palmately lobed leaves.

BEGGAR-TICKS

Several plants pass under the name of beggar-ticks. Some have globular burs covered with minute hooks, others have burs hooked only at one side or end, but the plant most commonly called by this name has a bur shaped like an old-fashioned boot-jack or pitchfork. Beggar-ticks are very common in low ground around swamps and in ditches, though some species grow by the roadside where the soil is drier. There are several species of the true beggar-ticks. All are annuals, usually growing in dense stands from seedlings produced during the early summer. Flowers and fruit are produced in autumn. The plants are two to three feet high with opposite simple or compound leaves with serrate margins. The tiny flowers are in heads surrounded by an involucre which is of two kinds, an outer and an inner. In some species the heads have a marginal row of yellow ray flowers like a miniature sunflower; in others the rays are lacking. Each tiny floret consists of an inferior ovary with one ovule, a calyx modified into two, three, or four barbed awns called *pappus*, a tubular corolla, five stamens united into a tube by their anthers, and a two-cleft style. In the course of evolution the ray flowers have lost by abortion both stamens and style, no fruit being produced by them. The plant belongs to the sunflower, or composite, family. Beggar-ticks can be best eradicated by cutting the plants before maturity so as to prevent seed production.

BEGGAR-TICKS
The teeth on the prongs of the fruits point toward the base of the fruit

CANADA THISTLE

Canada thistle is usually considered one of the worst weeds. Its bad reputation, like that of quack grass, is due to the long horizontal root-

stocks which creep through the soil. Cultivation breaks up and scatters these, thus helping to spread the plant. Only constant work can keep this weed in check. The Canada thistle is not a native of Canada, but of Europe. The common name therefore is quite inappropriate. This thistle has rather small, pinnately lobed, spiny margined leaves which are green on both sides. The numerous flower heads are much smaller than in other common thistles, and the involucre is not spiny. The florets are purple or white in color, and there are no ray flowers. The floral structure is like that of beggar-ticks except that the pappus is composed of many slender, branched, feathery hairs, the thistledown, the purpose of which is to aid in spreading the fruits, or achenes as they are called by botanists. The fruits are not really seeds, but each contains a seed. Canada thistle belongs to the composite, or sunflower, family, and is related to the bull thistle, a less troublesome species with much larger spiny heads, and the pasture thistle, which has still larger heads.

CANADA THISTLE

CLOTBUR

The clotbur, or cocklebur, is another member of the sunflower family. It is, however, so much modified that its relation to the sunflower is difficult to see. Clotburs are abundant in low sandy soil. They are annual, with stems about two or three feet high clothed with many alternate, broad, palmate-veined, and somewhat lobed leaves, margined with coarse bluntish teeth. The flowers are borne in

clusters in the upper leaf axils and at the summit of the stem. There are two kinds on the same plant, staminate and pistillate. The staminate florets are borne in clusters surrounded by an involucre in terminal and axillary racemes. These perish as soon as the pollen is shed, but the two-flowered pistillate heads gradually increase in size toward maturity until the fruit becomes much more conspicuous than the flowers. The two flowers of these heads are surrounded by a woody involucre as in the ragweed, to which the plant is closely related, but the involucre is much larger, one-half to one and one-half inches long, and covered all over with stiff spines, some of which are hooked. At the summit are two sharp beaks from which the styles of the two flowers project. The two achenes are retained within the bur until the latter decays. It is said that only one seed will germinate the first year while the other remains dormant until the second year. Clotburs are among the worst weeds in regions where they are abundant. The large burs entangle themselves in the fleece of sheep and in the hair of other animals, often causing considerable damage both to the animals, and, in the case of sheep, to the wool. Clotburs should be mowed down before the fruit forms.

THE COLLECTION AND PRESERVATION OF SPECIMENS OF PLANTS

K. M. Wiegand
Professor of Botany

KEEPING some sort of record is a very desirable part of the study of wild plants and weeds. The best record is a specimen of the plant, preserved and carefully labeled for future reference. A collection of such specimens is called an herbarium. Much of this work is being done now by schools in many parts of the State, but the results differ very greatly in value because of a lack of knowledge of the standard methods employed in the preparation of these specimens. In order that the standard methods of preparing plant specimens may become familiar to all teachers, the following very much condensed outline has been prepared. In this outline the apparatus used by the professional collector is described, and at the same time substitutes are indicated, which may be used in case these materials are not at hand.

The first step in preparing the specimen is, of course, to collect the plant in the field. Only first-class plants should be chosen, and they should be selected with reference to the size of the mount to be prepared. They should also be characteristic and not abnormal plants. If a small specimen of a large plant is desired, a naturally small plant should be chosen rather than one made small by mowing or by the browsing of farm stock. Do not select plants eaten badly by insects. Select those in flower, or preferably those with flowers and some young fruit. Specimens in fruit are also desirable. Collect, if possible, enough of the root to show the nature of the root stalk, and whether the plant is annual or perennial.

If the plant is normally a very small one, several specimens should be taken so that when finally mounted on the sheet the space will be fairly well occupied. For digging a plant a small hand pick is used by the botanist, but a trowel or a very strong knife is sufficient for ordinary purposes. In the case of a tree, a shrub, or a very large herb only a small portion of the plant can be taken. The specimen should show the flowers or the fruits, together with a short portion of the branch bearing leaves of normal shape. If the basal leaves differ markedly in type from those near the flowers, some of the former should be collected.

After obtaining the specimen, care must be taken that it does not wilt before being placed in press. A wilted specimen is almost worthless. To prevent wilting, the botanist uses a collecting box, usually of tin, with a tight-fitting door, in order that evaporation may be retarded as much as possible. As a substitute for this box, any handy tin box of sufficient size provided with a cover will do. For short trips, a paper shoe box may be substituted. If paper boxes are used, it is desirable that some water be sprinkled in with the specimens. Plants may also be wrapped loosely in newspaper, if sprinkled with water, and carried for short distances.

On returning from the collecting trip, the plants should be put in press immediately. The press is an important piece of apparatus. That used by the botanist consists of two press boards 12 x 18 inches in size, made up of oak slats crossing at right angles. Each slat is one inch wide and one-fourth inch thick, and there are five slats running the long way of the press board, and six across. These slats are nailed where they cross except on the outer edge where they are riveted. In place of the slatted board any thin board may be used. The press boards are placed above and below the stack of drying felts, between which the plants lie. The drying felts are pieces of the best quality soft carpet paper, cut 12 x 18 inches, and are designed to absorb moisture from the plants. The cheaper carpet papers are usually too hard and not absorbent enough. In place of these, single newspapers, each consisting as usual of several pages once folded, may be used. The plants themselves are placed between single sheets of unprinted newspaper, cut when folded $11\frac{1}{2}$ x $16\frac{1}{2}$ inches, the standard size of the herbarium sheet. The printed newspaper can be used as well. As a source of pressure, either one of two methods may be used. The press may be weighted down by a pile of stones or brick, or it may be strapped up with two straps stout enough to withstand a strong pull. The weight method is awkward, and not to be generally recommended. Such a press cannot be moved about, and the labor of moving the weights is considerable. For press straps, the leather holdback straps from harness or the woven trunk straps now in general use are recommended.

TIN COLLECTING BOX

The plant is taken from the collecting box, carefully cleaned, the roots freed from all soil by washing, and then it is placed on the open sheet of press paper resting on one of the driers. The plant is arranged in the

way in which it is desired to have it appear in the final mount. Some of the leaves are placed with the lower surface uppermost, and the flowers are arranged in a natural condition, if possible with some of them open so that the internal organs may be seen. The press paper is then folded over, another drier is placed on top, and the process repeated until all the plants are in press. The press is now strapped up with the straps arranged crosswise near each end. The pressure applied should be considerable except in the case of delicate plants. It should be sufficient to cause the press boards to bend slightly if the press is thicker in the middle than at the ends as is usually the case. Delicate plants require less pressure and are often harmed when the pressure is too great. After twenty-four hours the press should be opened, and the press paper containing the specimens, still folded, should be transferred to a set of dry driers preferably warm from recent exposure to the sun or a hot stove. At this change the specimens may be inspected, and folded leaves may be straightened. Each day the change of driers should be made until the plants are dry. If the change is not made, specimens are likely to mold or to discolor.

PLANT PRESS CLOSED AND STRAPPED

Many botanists prefer to place between the driers in the press, sheets of corrugated pasteboard with the corrugations extending crosswise. The press may then be placed on a stove or a radiator, and the hot air will circulate through the corrugations, thus making unnecessary the change of driers. Wet driers should be spread out in the sun, preferably on some dry surface. A tin roof or a porch floor is excellent. Specimens are dry when the parts show indication of becoming brittle and when they are no longer damp to the touch. Woody twigs are not dry when they will spring back to their old position rather than remain flat.

After taking the plants from the press, they should be allowed to remain in the press papers. These papers may be tied in bundles until some convenient time for mounting. Mounting paper is an important consideration. That used by the botanist is a rather firm and stiff white paper, the standard size of which is 11½ x 16½ inches. For a school herbarium, this size may be used if the school decides to make a standard collection,

The sheet cut to half size is often used when economy of paper is desirable. or when the collection is to be small. Such a sheet is, however, too small for good specimens of a great many plants. Regular mounting paper is difficult to obtain, and as a substitute the best grade of white paper obtainable will do fairly well. Interesting sets of plants are sometimes prepared on very light colored manila wrapping paper if it can be obtained in the proper thickness and uniformity of color and texture.

The specimens are glued to the paper. Liquid glue is ordinarily used. Care must be taken that a good quality of glue is obtained, not too dark in color. This is diluted slightly with water and spread by means of a flat paintbrush on a glass plate, which in size is slightly larger than the mounting paper. The specimen to be mounted is then placed on the glue, care being taken that all parts come in contact with the glue, and that the glue is not too great in quantity so that it will flow over the

PLANT PRESS OPEN AND READY TO RECEIVE SPECIMEN

edges onto the upper surface of the specimen. Some experience will indicate the exact quantity of glue to use. The specimen is then raised from the glue by a somewhat sliding motion, with the aid of the fingers and a knife, and transferred to the mounting sheet. In this transfer, care must be taken that the specimen is placed exactly where desired on the sheet, as its position cannot be changed after it once comes in contact with the paper. Space must be left on the mounting paper for the label, which should be located in the lower right-hand corner. Extremely delicate plants cannot be mounted by this method, as the parts will collapse when raised from the glue plate. Such plants must be carefully painted with glue by means of a small camel's-hair brush, after which the mounting sheet may be placed face downward on them. The mounted plants are placed between driers and under a weight for a short time while the glue is drying. In case of stiff or woody stems, the glue may not be sufficient to hold the specimens, and they are reenforced by means of small gummed

strips placed across the stems. The best material for these gummed strips is the gummed linen to be obtained at almost any bookstore. White court-plaster or gummed linen paper may be used, though the latter is not usually sufficiently strong. Some experience will show the size of such a strip from the standpoints of strength and of artistic appearance. They should be neither too large nor too small for their purpose, and should be placed on the plant in exactly the proper place to gain the desired result.

The botanist writes his label on a separate sheet of paper 2 x 4 inches in size, which is pasted at the margin in the lower right-hand corner of the specimen sheet. This label usually bears some printed legend across the top, such as the flora, the State, and the country which the plant represents. This, however, is not necessary for a small collection, and it is not even necessary that the slip be used, for the label may be written directly on the corner of the paper. In the latter case, care should be taken that the writing does not overrun a certain area, as, for instance, 2 x 4 inches. Neatness and uniformity in labeling is of great importance in the preparation of an attractive herbarium sheet. On the label there should appear in case of a school collection or a professional collection, the scientific name of the plant, the common name, the type of soil, the kind of place where the plant grew, whether open or wooded, wet or dry, the locality, the date of collection, and the collector's name. Specimens thus prepared can be filed in various ways. In the regular botanist's file, the specimens are placed in heavy manila folders, which, because of the fact that one is devoted to each genus of plants, are called genus covers. These are arranged in the proper families, and all are filed in pigeonholes in a specially prepared case. The school may adopt either this method or some simpler method. If small sheets are used, they may be bound in books, but this is difficult because the binding must be thickened to provide for the thickness of the specimens. A great disadvantage in the book system is the difficulty of adding new specimens from time to time in the proper classification.

A collection of plants, prepared as has been outlined, will be found of great benefit to the school. It will serve for reference and comparison, and the building up of the collection will be a stimulus in the study of the local plants. It offers opportunity for exact, careful work, and may also serve to increase the artistic feeling of the pupil. In various other indirect ways it will be found an advantage. To aid in the identification of specimens the school library should contain some good book on plant life. In case difficulties are encountered that cannot be solved locally, the Department of Botany at the College of Agriculture, Ithaca, New York, is always glad to be of service.

FOUR SPECIMEN SHEETS FROM AN HERBARIUM, SHOWING DIFFERENT METHODS OF ARRANGEMENT

PLANT QUOTATIONS

But not alone the fairest flowers:
The merest grass
Along the roadside where we pass,
Lichens and moss and sturdy weed,
Tell of His love who sends the dew,
The rain, and the sunshine, too,
To nourish one small seed.

By DANTE GABRIEL ROSSETTI

FLOWERS

God made the flowers to beautify
The earth, and cheer man's careful mood;
And he is happiest who has power
To gather wisdom from a flower,
And wake his heart in every hour
To pleasant gratitude.

By WILLIAM WORDSWORTH

GRASS AND CLOVER

Hush, ah hush, the Scythes are saying,
Hush, and heed not, and fall asleep;
Hush, they say to the grasses swaying,
Hush, they sing to the clover deep!
Hush —'tis the lullaby time is singing —
Hush, and heed not, for all things pass,
Hush, ah hush! and the Scythes are swinging
Over the clover, over the grass!

From *Scythe Song*
by ANDREW LANG

NASTURTIUM

I am the gay nasturtium,
  I bloom in gardens fine;
Among the grander flowers
  My slender stalk I twine.
Bright orange is my color
  The eyes of all to please.
I have a tube of honey
  For all the bees.

From *Chorus of the Flowers*
by LUCY WHEELOCK

CROCUS

Do you know why the crocus grows
Under the snows?
To tell that the winter is over and gone
And soon bird and blossom will gladden the lawn
And the hedgerows
Where the first crocus blows.

From *The First Crocus*
by KATE BROWNLEE SHERWOOD

JACK-IN-THE-PULPIT

Jack in the pulpit
Preaches today
Under the green trees
Just over the way.
Squirrel and song-sparrow
High on their perch
Hear the sweet lily-bells
Ringing to church.
Come, hear what his reverence
Rises to say,
In his low, painted pulpit
This calm Sabbath day.

By CLARA SMITH

PUMPKIN

O,— fruit loved of boyhood! The old days recalling
When wood grapes were purpling and brown nuts were falling!
When wild, ugly faces were carved in its skin
Glaring out through the dark with a candle within!
When we laughed round the corn-heap with hearts all in tune,
Our chair a broad pumpkin, — our lantern the moon,
Telling tales of the fairy who travelled like steam
In a pumpkin-shell coach with two rats for her team.

From *The Pumpkin*
by JOHN GREENLEAF WHITTIER

LAUREL

Each chalice holds the infinite air,
Each rounded cluster grows a sphere;
A twilight pale she grants us there,
A rosier sunset here.

From *Mountain Laurel*
by ELAINE GOODALE

IRIS

Born in the purple, born to joy and pleasure,
Thou dost not toil nor spin.

* * * * * * * *

The wind blows, and uplifts thy drooping banner,
And round thee throng and run
The rushes, the green yeomen of the manor,
The outlaws of the sun.

From *Flower-de-Luce*
by HENRY WADSWORTH LONGFELLOW

WEEDS

The face of Nature smiles serenely gay;
And even the motley race of weeds enhance
Her rural charms: Yet let them not be spared;
Still as they rise, unconquered, let the hoe,
Or ploughshare crush them. In your fields permit
No wild-flower to expand its teeming bloom:
In wood and wild there let them bud and blow
By haunted streamlet, where the wandering bee,
Humming from cup to bell, collects their sweets.

From *British Georgics*
by JAMES GRAHAME /

WEEDS

I will go root away
The noisome weeds, that without profit suck
The soil's fertility from wholesome flowers.

From *Richard II*
by WILLIAM SHAKESPEARE

TREE STUDY

The Editor

TREES may be studied by field trips to particular trees, to woodlots, to forests, to orchards, to lumber mills, to carpenter shops; making collections of tree leaves, or flowers, or fruits, or barks, or twigs, or woods; preparing mounts each one to show the complete set of parts for a particular tree; the making of drawings and leaf prints; and planting trees and caring for them.

The syllabus calls for a special study of the elm this year, one of our most beautiful shade trees. In the list for recognition are two kinds of fruit trees, one conifer, and any four of the following: spruce, pine, juniper, plum, apple, walnut, dogwood, maple, sumac, oak, fir, and tulip tree, offering a wide variety of types and degrees of usefulness.

Children may be led to see the contribution that trees make to the landscape, and from this it is easy to go to the consideration of their many uses. Boys and girls should come to consider trees just as much a crop as corn or potatoes, and as needing intelligent care if the best results are to be obtained.

In sections of the State that are too rough for the cultivation of general farm crops, and that are primarily adapted to the growing of trees, forest study will be of particular value. All farming communities include bits of rough, waste land that are best adapted to growing trees and that should constitute the farm woodlots. Many needs for wood arise on the average farm, not only for fuel but for fence posts, poles, and other things; and the woodlot should be an essential part of the farm economy, and one that is given due consideration.

The great usefulness of trees in regulating the water supply is a matter that children may readily be helped to understand. The spongy mat of leaves that accumulates under trees helps to hold rainwater and to keep it from running off as rapidly and as violently as it would from the bare surface. Moreover, the periods between rainfalls would be very dry

because there would be no supply of reserve moisture. By soaking up the rain as it pours down, and then gradually yielding it up, the forests and woodlots are of inestimable value.

Aside from its economic phases, there are many interesting and valuable aspects of tree study from the natural history point of view. It is a subject that offers new opportunities constantly, as the trees change their appearance with the change of seasons. In the fall the leaf forms may be studied because the children are attracted to them by the rich colors. One method of identifying the different kinds of trees is by their leaves, and such a study is well worth while. The winter aspect of trees is also interesting. Almost every kind of tree has a characteristic form that will identify it, and boys and girls may easily become familiar with many of the different species.

Many boys and girls have never realized that all trees have blossoms. They are familiar with the blossoms of some of the more striking kinds, such as the locust, the horse-chestnut, and, perhaps, the red maple, and the basswood; but once awake to the subject they will eagerly search in the springtime for the less conspicuous blossoms of elm, ash, hickory, oak, and others. A reading glass or a tripod magnifier would serve to bring out the parts of some of the tiny flowers more clearly. Many of them are strikingly beautiful.

There are various kinds of tree mounts. Those of the various kinds of leaves will serve as a basis for comparative study and reference. Boys and girls sometimes make mounts of wood specimens from the different trees growing in the neighborhood. The specimens as a rule are small, usually obtained from one of the younger branches, and are rarely characteristic enough to permit of identification after they have been separated from the tree. The value of such mounts chiefly lies, therefore, in their preparation as the children visit the different trees and obtain the specimens. They have no great value in themselves when completed unless the specimens can be large enough to be typical and distinctive.

A third kind of tree mount has often been described in the leaflet and is one with which the schools are familiar. One mount is made for each kind of tree and shows as far as possible the different parts of the tree — leaf, flowers, fruit, young and old bark, and cross and longitudinal sections of the wood. The preparation of such a mount involves the whole cycle of the year in order to obtain the different parts. When complete it offers a good basis for reference work in the study of the characteristics of a particular species, and the preparation of such a mount for each kind of tree found in the district would be valuable educational work. It would not be wise, however, to destroy a tree simply to obtain specimens for a mount. Children should be led to appreciate the time it takes to

grow a tree, and to hesitate before they do anything to cut short its life. If they are making tree mounts, they will be alive to the opportunities that offer themselves from time to time in the district to collect the needed specimens as the farmers cut trees of different kinds in the woodlots.

A most valuable asset is the ability to recognize different kinds of wood as one encounters them in firewood, or in raw lumber, or in furniture and house finish. If there is a sawmill in the district, it can be visited with much profit, and no doubt the manager will be more than glad to explain the different operations of the mill and the purposes for which the wood is designed, if the children show an earnest interest. Almost every community will have a carpenter's shop, and here again a visit may be made a most profitable experience, learning from the carpenter the different kinds of wood and the different uses to which he puts them.

Finally there is always the opportunity for boys and girls to make a real contribution by planting trees that will in time be a source of pleasure or profit. Trees should be planted on the school ground if they are needed, or, if there are enough trees on the school ground as is often the case, many opportunities can be found along the highways for constructive planting. Some schools have gone into the matter more intensively and have planted a plot of ground to trees just as a forester would start a forest, or as a farmer would develop his woodlot.

On visits to the woods and on camping trips and picnics, boys and girls should be led to appreciate the danger to forests from injury by fire and to form the habit of exercising care and precaution whenever a fire is built, in order that they may not be responsible for damage done.

OUR FORESTS

John Bentley, Jr.
Professor of Forest Engineering

Forests and woodlands are valuable not only as a source of wood and lumber, but also because of the beneficial effects they have on water supply. In this State nearly all large streams and rivers rise in mountains or hills that were originally covered with a dense growth of timber. The ground was covered with leaves, and the trees broke the fall of the rain so that, instead of rushing down the mountains or hills, the water soaked into the ground and reappeared farther down as springs. Thus the flow of water was kept regular and even, and because of this the water was clear. After the forests were cut the leaf litter was washed away or destroyed, and soon the heavy rains began to make gulleys in the land; so that sometimes the streams were high and at other times low, and after heavy rains they were often muddy.

The contrast is very marked between streams that come from mountains covered with timber and those that flow for a long time through treeless regions. Travelers who have crossed Montana, Nebraska, Kansas, or Wyoming know that all the rivers in those states are muddy; while the rivers in New York, Pennsylvania, West Virginia, and other Eastern States in which there are many mountains covered with timber, are comparatively clear and clean. This is because the forests hold the soil in place and prevent it from being washed away by heavy rains.

Woodlands and timber at the headwaters of our streams and rivers should therefore be preserved, and to insure good, pure, clear water for drinking purposes springs and small streams that form the source of our water supplies must be protected by a good growth of timber.

In the development of this country a great deal of timber has been destroyed. Careless hunters or travelers, passing through the woods, have been responsible for starting many extensive forest fires that have destroyed not only the timber, but all the leaf mold on the ground so that many years must elapse before another generation of trees can grow. Sparks from railroad locomotives start fires that destroy much timber every year. H. S. Graves, Forester for the United States Government, states that since 1870 fifty million acres have been burned over by forest fires, resulting in a loss of fifty million dollars each year. This great waste can be eliminated largely by proper care.

Also insects damage trees. Beetles bore into trees and kill them, and caterpillars eat the leaves and cause the trees to die gradually. As a result of fires, insects, and lumbermen, the woodlands and forests of our country have disappeared rapidly. We must therefore begin immediately to take care of our forests, and this can be done in two ways: first, by protecting them against fire and using them wisely without waste or destruction; and second, by planting new trees or sowing seed in places where trees will grow but where there are no old trees to furnish seed. Even in small communities much can be done toward helping to save our forests if each one will do his part. Boys and girls should be taught the danger of leaving a fire unguarded; it should always be extinguished before they leave the woods. They should also be taught to protect young trees that are coming up, so that they will not be trampled on or uprooted. A most valuable nature-study lesson would be to teach the pupils to gather some seed and sow it in treeless places. They will then be doing something that in years to come will contribute greatly toward the welfare and prosperity of the community; also they will have the delight that comes from watching the growth and development of the trees from year to year. Participation in an enterprise always creates lasting interest in it.

FORESTRY IN THE RURAL SCHOOLS

Frank B. Moody
Formerly Extension Professor of Forestry

Some educators who are deeply interested in having boys and girls take an interest in all phases of agriculture consider that side by side with instruction in the care of the orchard and of the shade trees about buildings and along highways, the raising of a useful crop of wood might give opportunity for educational work.

Forestry experience teaches the following principles:

1. Certain phases of forestry, such as the planting and the care of the woods, are a real part of agriculture, since they have to do with raising a crop from the land. The methods are simple, and the results are even more certain than those of other lines of agriculture. Forestry can make the land profitable. It is especially suited to this country, in so far as it is developed with less labor and can make a larger income from rough and mountainous lands than any other form of farming; and it has served in Europe to prevent millions of acres from becoming useless, barren waste.

2. Forestry helps to regulate the distribution of water and to lessen the rigors of climate, and in so doing it aids all forms of agriculture. It cares for nature's greatest means for beautifying the earth.

3. It provides a local supply of timber and protects the farmer and the townsman against exorbitant prices of importation; it stimulates local industries, and thus creates a local market for produce.

4. It is not a new and untried industry, but has been in actual practice for more than a thousand years and has not failed in any locality where it has been correctly and consistently practiced.

5. It is of particular interest to farmers, since it adds to the value and the beauty of the farm and to the safety, the comfort, and the income of the farmer; and it does all this without great expenditure of capital or labor.

6. It is well suited to state, county, and township ownership and enterprise, and could well be utilized in this State, as it is in the Old World, to maintain larger tracts of inferior lands in useful condition and at the same time lessen the tax burden in the very locality where the taxes weigh heavily.

To sum up, then, the forest is needed everywhere because people must be supplied with wood and timber; it makes the best crop on rough and poor lands; it regulates water distribution and local climate; and it beautifies the land. The question now comes, What can the rural school

do in forestry? This question has not yet been answered, nor will it be until much thought and experiment have developed good pedagogy in forestry. All teachers in rural schools can help in this, and it is hoped that some useful and interesting work will result this year. The following are a few suggestions:

1. Help the children to organize what they already know of trees and woods, and by demonstrations help them to knowledge that will be more definite and exact. Most farm boys know an oak from an elm, but the knowledge is not clear, exact, and reliable as it may be. A few questions, and a simple comparison of leaf, fruit, and the like, will make a good beginning.

2. The boys and girls should be encouraged to talk about the woods — where they are, to whom they belong, how large they are, what is being done with them. The children will begin to see the woodlot in a new light. They will realize that some one cares about the trees, and they will bring to the schoolroom not only specimens, but also observations and information.

3. Economic interest in forestry may be stimulated by some suggestions, such as the following: How logs are taken to mill; to workshop; the value of this to the farmer and to men in mill and workshop; how the workers spend their money to buy produce, hay and feed, provisicns for their homes, and the like. Let the pupils follow up these considerations to a discussion of big markets, transportation, and general manufacture, and lead them to see what timber and the products of the woods mean to people.

Help the boys and girls to realize how the forest influences run-off; the springs and the rivers; how it keeps the land from gullying and washing; how it breaks the force of cold and drying winds, and therefore helps the farm crops. Also develop an appreciation of trees and shrubs and woods as the great decorative feature in the landscape.

The economic losses due to waste land will be of value in discussions of forestry. Any farm boy or girl readily appreciates that there is loss every time an acre of land is allowed to lie unused during a growing season, and that this loss is real, immediate, and irredeemable, and may be measured by the value of the crop that the land could grow. The amount of this loss in the vicinity and township leads up to a few figures regarding the county and the State, and brings home the importance of this subject.

4. In many ways the teacher can help the pupils to realize the pleasure that comes from trees and woods — the shade and shelter about the house and on the highway, the place for camping, berrying, and nutting, for finding wild flowers, birds, squirrels, rabbits, and other interesting animal life, for fishing and other outdoor experiences. The children may also be

taught that it is a duty to try to keep the farm, the township, and the county as beautiful and homelike as possible, and that the trees help in this.

5. The pupils should be encouraged to gather tree seeds, to plant forest and shade trees and shrubs, and to trim, thin, and protect them; these processes are all so intimately connected with farm work that very little teaching, in the ordinary sense, is required. Every farm boy of twelve knows how and where to gather a few nuts, acorns, seeds of maple, ash, and the like. He also knows how to sow or plant seeds, and how to place a small tree so that it will grow. He may be taught that with a spacing of four feet by four feet these trees, before long, will suffer if left alone; that they will crowd one another, and pinch and cripple their crowns; that the weaker will die off; and that it is better to thin such a thicket rather than to leave too many trees to injure one another and retard the growth of the entire stand.

The matter of protection of trees is important. The children know that trees suffer if mutilated, and that a forest fire is always serious. When children learn from teacher and parents about the value of the woodlot, they will not be so likely to commit vandalism in the woods.

PROPAGATING TREES IN SCHOOL GARDENS

John Bentley, Jr.
Professor of Forest Engineering

The fact that the raising of trees in a nursery occupies one to three years, and that much of the work can be performed during the time that school is in session, makes this kind of work very desirable for schools. Besides, a tree is of permanent value. After being raised from seed and cared for in the school garden, it can be transplanted to some place where it is needed. It then becomes not only an object lesson but a thing of beauty and of permanent value, reflecting credit on those who have been thoughtful enough to plant and care for it.

A school garden nursery should be started on a small scale, so that it will not become too large to handle when the trees need more attention. If each pupil raises eight or ten trees, plenty of interest and activity will be provided.

Seed.— Seed and a suitable place in which to sow it are the first considerations in starting a tree nursery. It is best to begin with a very few kinds of trees and see whether they can be grown successfully; perhaps the more difficult kinds, such as the conifers, can be attempted later. The seeds that are easiest to gather are those of the oaks, the maples, the locust, the ash, the hickories, and the beech.

The soft maple matures its seed from the first to the middle of June. The hard maple, and all the other trees mentioned, mature their seeds in the fall and must be gathered in the fall. In practically all cases, tree seeds must be gathered chiefly by hand. Certain classes of them, such as locust seeds, acorns, and hickory nuts, which fall readily with the wind and frost, may be gathered from the ground after they have fallen. The seeds of the hard maple and the ash should be picked from the tree or collected from the ground as soon as they fall.

Storing the seeds.— The hulls of walnuts and hickory nuts may be dried and removed, and the nuts spread out to dry in a cool, airy place. Acorns that are difficult to remove from their cups may be left in storage with the cups attached. The seeds will keep better if allowed to dry slightly, so as to avoid molding. The interval between collecting and storing for winter may be used to dry the seeds.

The seeds should be stored in bags hung in a dry cellar, or they may be stratified in sand in a pit out of doors. The pit should be in high ground, so as to insure good drainage, and may be protected from mice and squirrels by means of wire netting or boards. The bottom of the pit should be covered with a layer of clean sand, two or three inches deep. On this a layer of nuts should be spread, and then another layer of sand. This process should be repeated until all the seeds are stored. The whole should be covered with from four to six inches of earth. A mulch of leaves and hay spread on top and weighted down with boards or stones, may be added. Freezing will not injure the seeds, but rather will assist in opening the hard shells, thus making germination easier in the spring.

Preparing the seedbed.— In the spring, preparations should be made for sowing the seeds in beds. The site for the seedbed should be level or gently sloping rather than steep, in order to prevent washing. Ground that has been under cultivation for a year or more is better than fresh ground, if it is free from cutworms and is in good condition. A loose sandy loam is preferable to a clay, and it is most important that the soil should be rich, mellow, porous, and well drained. The ground should be spaded deeply, worked over, and thoroughly pulverized by raking and harrowing until all clods, stones, and rubbish have been removed.

As a rule, the seeds of the broad-leaved trees should be planted in rows about twelve to eighteen inches apart. This will allow plenty of room for cultivating the seedlings.

Time of planting.— Most tree seeds should be planted as early in the spring as the ground can be worked. Exceptions are silver maple, red maple, white elm, and any others that mature in the late spring. It would be difficult to keep these seeds over summer, and consequently they should be planted as soon as they mature. Also white oak acorns

should be planted in the fall. If they are kept over winter only a few of them will germinate, and such as do germinate will be slow in starting.

Nuts and acorns of good quality may be planted two or three inches apart in the row, while smaller seeds, such as those of maples, ashes, and elms, should be spaced from one-half to one inch apart. The depth of planting should never be greater than twice the average diameter of the seeds. It is better that they should be planted a little too shallow than too deep; if too deep the sprout cannot push its way through the soil.

Cultivation.— The seedbed should be thoroughly cultivated and kept free from weeds. The more attention and cultivation that can be given throughout the summer, the better will be the results at the end of the growing season. If rains do not furnish enough moisture, the beds should be thoroughly soaked with water once or twice a week in either early morning or late afternoon.

After the first season it may be desirable to protect the trees during the winter by a mulch of straw or leaves six inches to a foot in depth and held in place by poles or slats to prevent the wind from blowing it away.

Transplanting.— When the trees are one year old, all except the very slowest-growing are ready to be transplanted from the seedbed to another bed, or to a small plantation where they can still have some care and attention. During this second year, they should have more room for the development of both root and crown. The protection afforded by older trees is often of great value; therefore, if possible, the transplant bed should be partly shaded by a row or grove of older trees. Usually young trees should be transplanted in spring before growth starts, preferably on a damp or cloudy day. Great care should be taken not to destroy the rootlets or expose them to the action of sun and wind during transplanting. In order to prevent this the young trees should be lifted with a mass of earth about the roots, and wrapped in wet burlap or other coarse cloth. Hickories and oaks have a large taproot, and this may be cut off about one-third. The top of the seedling should be trimmed until it is approximately the same size as the root system.

The bed to which the one-year seedlings are transplanted should be prepared in the same manner as the seedbed. They should be set about one foot apart in rows two to three feet apart. This permits easy cultivation. If the ground is very dry, the hole in which the tree is to be set should be dug and filled with water some time beforehand, in order that the soil around the roots may be thoroughly moist.

The trees will be ready for final planting at the end of the second year. Especially the trees with large taproots, such as the hickories and the oaks, should be set out at the end of the second year; otherwise they will be difficult and expensive to transplant.

ELM

(For special study)

JOHN BENTLEY, Jr.
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Of the many trees common in New York State, the elm is doubtless the most familiar to boys and girls, for it is a tree of the farms, the home lawns, and the streets of the towns, rather than a tree of the deep woods.

ELM IN SUMMER

While it is found occasionally in the forest, it is almost always scattered among other trees and never forms a large proportion of the forest, as do maples, birches, pines, or oaks. Throughout the New England States, New York, and Pennsylvania, the elm is one of the commonest shade trees, not only for the streets of the towns and villages but also for the grounds about the home. The tree is so graceful and beautiful, and, when old, so stately and dignified, that it well deserves the place which it holds in the estimation of the people.

The elm has a very distinctive form and habit of growth. Other trees seen from a distance are not always easy to recognize. The maple and the beech look somewhat alike, especially when young; the oak and the chestnut, the ash and the hickory, resemble one another slightly. But the elm, with its massive trunk — which quickly breaks up into several large branches, giving the tree an urn-shaped appearance—and the delicacy of the twigs and branchlets, forming a crown with a fringe-like margin, is easy to recognize even at a distance. To a remarkable degree the elm combines strength with grace and beauty.

The elm is widely distributed. It is found in southern Newfoundland and through the southern part of Canada as far west as the northern shore

of Lake Superior. It grows along the Atlantic coast as far south as Florida, although it never reaches very large size in the southern part of its range. Westward it is found from South Dakota to Texas, although not in such large numbers as in the East. Everywhere it shows a preference for the low, rich lands that border rivers and streams, and it grows to its largest size where the soil is rich, fertile, deep, and moist. Under favorable conditions it will grow to a height of one hundred and twenty feet and a diameter of eleven feet. Many very large trees have become famous, as the large elm at Lancaster, Massachusetts, and the two elms on the river bank at Wilkes-Barre, Pennsylvania. It is the wide spread of the branches, as well as the massive size of the trunk, which makes the elm impressive; sometimes the crown of a tree measures one hundred and twenty feet across.

ELM LEAVES AND FRUIT
About one-fourth natural size

The elm tree, large as it is, springs from a very small seed. The flowers, which are inconspicuous, blossom early, before the leaves are fully grown, fade soon after, and are quickly followed by the ripening seeds. These small seeds have wings on the margins, with sharp points, and are very short-lived. Unless they fall on a good seedbed and germinate immediately, they die. They cannot wait, as do the seeds of the hickory, the pine, and many other familiar trees. Besides plenty of moisture, which is one thing that the little elm seedling must have at the start, the quality of the soil and the amount of light that comes to the seedling have great influence on its growth. The soil must be rich and mellow, so that the rootlets can penetrate easily and find plenty of food material, and there must be plenty of light, so that the seedling can grow rapidly and become able to take care of itself before the autumn frosts arrive. This demand for light is one reason why we do not find elm trees in the deep, dark woods. When we do find an elm in the forest, it is because there was an opening in which the little seedling could get a start. Elms will not do well when they are overtopped by their neighbors.

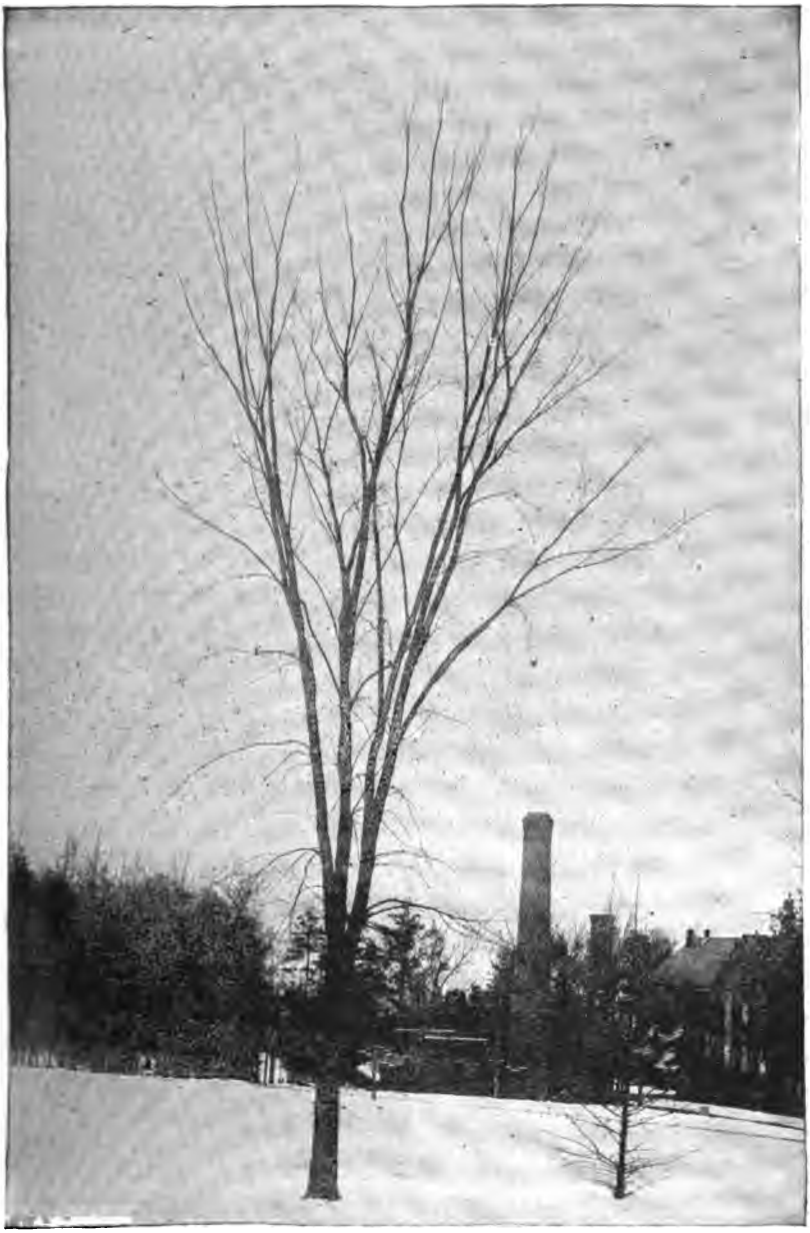
When standing where there is plenty of room and light, the elm tree grows rather rapidly. Many men who do not consider themselves old can remember the time when, as boys, they watched their fathers set out elm trees along the roads or on the lawn, and those trees have now grown to be of large size. But the largest elms — those that are one hun-

dred feet high and six to ten feet in diameter, with the large, spreading crowns — are probably two hundred years or more old.

Whether the elm is more beautiful in summer or in winter it is difficult to say. In summer its dense foliage hangs in graceful sprays from the drooping branchlets at the ends of the long limbs, swaying in the breeze and making a delightful shade. The upper side of the leaf is dark green; the under side is grayish green, reflecting a soft light which is very pleasant. In winter, stripped of its foliage, the elm shows its strength — not the rugged strength of the oak, with its gnarled, irregular branches, but a supple strength suggestive of self-contained reserve force. It is in the winter, too, that the delicacy of the smaller branches is seen to best advantage. Every wind sways them, but they do not break; they yield gracefully and seem to enjoy the blasts of winter.

Unfortunately the elm is the prey of a tiny insect, the elm leaf-beetle, which eats the leaves and threatens to injure the tree severely in some parts of the country. This little insect has damaged thousands of elm trees during the past few years; and although many persons have worked hard to get rid of it, the pest is continually spreading. The shade trees in towns and cities suffer most, apparently, and it is necessary to act promptly if the elm trees are to be saved. The insect is only about one-fourth of an inch long, brownish yellow in color, marked with a dark line along each side of its back. It sleeps during the winter, and the same warm days that bring out the elm leaves awaken this enemy of the elms. The beetles fly to the trees and eat small holes in the leaves. In a few days the eggs are laid, and these soon hatch into little grubs which begin in earnest to eat the leaves. So many eggs are laid that the number of grubs at work on the leaves is enormous. In fifteen or twenty days the grubs have completed their growth, and, unfortunately, their work of destruction also. They then crawl down the tree, and in another ten days emerge as full-grown beetles and are ready to repeat the process. Sometimes there are two complete broods of the insects in a single season, but the last brood as a rule does less damage than the first. The only way to save the elms from this enemy is to spray the leaves with a poisonous liquid. Although it costs twenty-five to sixty cents to have a tree sprayed, it will be necessary to spray our elm trees systematically if we wish to save them.

The wood of the elm is useful for purposes demanding great toughness. It is often used for barrels and fruit baskets. It is hard to split and work, and for that reason carpenters do not use it for woodwork or finishing; but if tough wood is needed, a better wood than that of the elm is difficult to find.



AMERICAN ELM IN WINTER

This young tree is beginning to show the graceful vase-like form which is characteristic of elms that grow in the open

TREES TO BE RECOGNIZED IN 1918-1919

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SPRUCE

The Norway spruce is common in the eastern United States although it is not native to this country but has been introduced from Europe. It grows in a larger variety of soils and is more useful than the native species for planting in parks and lawns.

NORWAY SPRUCE CONE
About one fourth natural size

The native spruces, however, are exceedingly useful, and, although they are not commonly seen, except in the mountains or in cold, deep swamps, they contribute wood and lumber to some of the most important industries. The red spruce, which is found in the mountains of the northern United States and in Canada, produces wood that is very useful for the manufacture of paper pulp. Most of the daily newspapers are printed on stock made from spruce pulp. For certain uses, such as sounding boards for musical instruments, and for timbers where great strength combined with lightness is required, spruce lumber is excellent. During the war, spruce was in great demand for airplane construction.

NORWAY SPRUCE

The Norway spruce has a very long cone compared with the native spruces, and it can always be distinguished from them by this characteristic. All spruces have short four-sided needle-like leaves, set singly on all sides of the twig.

PINES

In the winter months, when most of the forest trees are leafless, hemlocks, firs, spruces, and pines, with their dark green foliage, are a cheerful sight. It makes one feel that after all the woods are not lifeless in winter, and that there are some trees bold and hardy enough to withstand the snow and the cold. Pines are particularly noticeable, because there is more motion and life in their foliage

than in the stiff, rigid foliage of spruces and firs. Then, too, pines are more familiar to most of the boys and girls in the State, because spruces and firs belong to the cold climate of the mountains.

Five pines are native to New York State, and others have been planted in parks and on private grounds. The five native pines are white, pitch, red, or Norway, jack, and Jersey scrub. The last two are not very common, and generally only the three first mentioned will be found.

The pines as a group are marked by three characteristics. These are (1) the needle-shaped leaves, borne in clusters of two, three, or five needles; (2) the cones, in which the little seeds are borne; and (3) the wood, which always contains more or less pitch, or resin. These characters distinguish the coniferous (cone-bearing) trees from the broad-leaved trees. The term *evergreen* should not be applied to pines, spruces, and firs, because there are other trees, such as the holly and the live oak, which retain their leaves throughout the winter and are just as truly evergreen as is the pine or the spruce. Then there is the larch, which bears cones and yet sheds its leaves every year. The leaves of the larch are needle-shaped, it bears cones, and there is some resin in the wood; therefore it clearly belongs to the same family as do pines, firs, spruces, and hemlocks. In order to avoid all confusion, therefore, it is suggested the pupils learn to call all cone-bearing trees conifers, which means cone-bearers. The others may be called broadleaf trees; this will properly include the live oaks and the holly, and will do away with the confusing term *deciduous* (leaf-shedding) trees. Another term that is frequently heard is *hardwoods*. As generally used, this term means the broadleaf trees, although there are some conifers with very hard wood — yellow pine, for example — and some hardwoods, or broadleaf trees, with very soft wood, such as the poplar and the willow.

WHITE PINE

The use of confusing terms should be abandoned, and the terms *conifer* and *broadleaf*, while sounding a little strange at first, will express the meaning more closely.

The pines are nearly all of great value because of their wood, which is strong for its weight, straight-grained, and easily worked — that is, carpenters have little difficulty in planing and shaping it to their purposes. Some pines have very hard, heavy, resinous wood, as the southern yellow pine; but the northern white pine is light and soft and contains only a moderate amount of resin. The white pine was formerly the most important timber tree of all the northeastern States, and many millions of board feet of white pine have been cut from the forests of New York within the past century. It is still considered a very valuable tree, and lumbermen are always glad when they can find any white pine to cut, because they know that it will bring a good price in the markets.

PITCH PINE

The white pine is a tall, straight-trunked tree, in many cases reaching a height of one hundred and twenty-five feet in the dense forests of the Adirondack Mountains. When growing in the woods the trunk is in many cases clear of all branches for sixty or seventy feet; but when grown in the open, where it has plenty of room, the crown is broad, with many limbs growing to within fifteen or twenty feet of the ground. Under these conditions the tree never grows very tall. The lumberman likes best of all the tall, straight trees of the forest, for they yield fine, straight-grained lumber with few knots.

The white pine can be distinguished from the other pines of this State by the needles, which grow in clusters of five. If the foliage of a pine tree is examined, it will be seen that the needles, instead of growing singly, grow in bundles, or clusters. In the white pine there are always five needles in a cluster. The individual needles are from two and one-half to five inches long, slender, flexible, bluish green, with a fine white streak. Some cones may be found growing on the tree, or those that have fallen from the tree and are now lying on the ground may be examined. The

white pine cone is about five inches in length, is usually slightly curved, and is slender, rarely exceeding an inch in thickness. It is free from spines, or prickles. If a dry cone has been picked up, the seeds have doubtless been shed and scattered; but if a fresh one can be found with seeds in it, it may be seen how each seed is provided with a thin wing, which enables the wind to blow it for long distances.

The pitch pine is probably the second commonest pine tree of this State. It is generally found growing on very poor soils, where only the hardiest trees or shrubs will thrive. This tree can grow in these poor situations because of its thick bark, which is often two inches thick at the base of the tree, and because it can resist fire much better than can the white pine. It is not nearly so neat in appearance as the white pine; its branches are irregular, the trunk is not so tall and straight, and the old cones frequently hang on the tree for years. The foliage is stiff, and the needles are borne in clusters of three; this at once distinguishes it from the white pine. The needles are dark yellow-green instead of blue-green. The cones are short and stout, about two or three inches long and two inches thick, and each cone scale is armed with a prickle. There is not the slightest resemblance between the white pine and the pitch pine in needles, cones, or bark; and if the wood is examined after the tree has been cut, no resemblance will be found there. The wood of the pitch pine is coarse-grained, full of pitch, and not adapted to the fine work for which white pine is used. Indeed, the wood of pitch pine is of little value except for coarse, rough lumber and for excelsior.

The red pine, or Norway pine as it is often called, is not found in many parts of this State. It is common only in the Adirondack region, where it grows on light, sandy soils and has plenty of sunlight. It may be found occasionally, however, in other parts of northern New York. It can be distinguished by its flexible needles four to six inches long, which are borne two in a cluster. The cones are from two to two and one-half inches long and have no prickles. Taking the cones and the needles together, there is no danger of confusing this pine with the other two species mentioned.

The red pine reaches a height of seventy-five or eighty feet. The wood is harder than that of the white pine, yet like white pine, it is not durable in contact with the soil. Because of its hardness it is not so valuable for timber as white pine, but the red pine possesses the great advantage of being able to grow well on land too poor to produce a satisfactory crop of white pine. It rarely makes close forests, because it demands a great amount of light for its growth. Red pine trees are never found in large numbers together, at least in this State, but are found mixed with other trees, especially at the edge of lakes or in openings

throughout the sandy stretches of country common in the Adirondack Mountains.

The jack, or scrub, pine is not common in this State except in dry, sandy, barren soils in the extreme northern part. It is usually a small, scrubby tree, with irregular branches, and of such poor form that it is practically worthless for lumber. The leaves are bluish green, covered with a gray bloom, and about two inches in length. They are borne in clusters of two, are twisted, and have a tendency to spread apart. The cones are small, rarely more than two inches long, and are armed with small prickles, which, however, may drop off.

The Jersey scrub pine is still more irregular and worthless as a lumber-producing tree. It grows in poor, sandy soil and is found growing wild in New York State only on Long Island. The needles are borne in clusters of two, and the cones have prickles.

JUNIPER

The juniper is distinguished from all other conifers by its fruit, which is a berry. The blue berries of the common juniper, or red cedar as it is often called, are a familiar sight. The tree is very slow-growing, but it can be grown on poor, sterile soils where nothing else will thrive. The juniper, which is common in rocky pastures, rarely has an opportunity to grow more than thirty or forty feet tall, for long before it attains its full size it is cut down for fence posts or other useful purposes. A southern form of this cedar was formerly very extensively used in the manufacture of lead pencils, but it has become so scarce of late years that other and cheaper woods have been substituted for it. The wood of the juniper is light, easily worked, and very aromatic. The odor, which is so pleasant, is distasteful to insects, and this renders the wood proof against their attacks. The wood is also very durable when in contact with the soil. For these reasons cedar is used largely for fence posts and for the manufacture of chests in which to keep woolen clothing.

PLUM

A discussion of the plum will be found on page 193.

APPLE

A discussion of the apple will be found on page 195.

WALNUT

The walnut tree, the nuts of which are familiar to all, was formerly abundant. Its great popularity as a wood for fine furniture and cabinet-making has so reduced the supply that it is now a comparatively rare

tree. It is found from central New York southward to Florida, but it reaches its best size on the western slope of the Allegheny Mountains. It was in the region of the Ohio River that most of the fine walnut was cut a number of years ago, and it is still occasionally found there on rich, mellow soil in protected sections. So valuable has it become that in some places lumbermen are going back after the stumps of the trees that were cut years before, digging them up and making veneers from them.

In earlier days walnut was much used for fence rails. As the wood is very durable, old rails may be sound, and in some sections even these old rails have been used in the manufacture of small products.

A peculiarity of the walnut tree, which is a serious matter when making plantations, is that even the one-year-old tree has a very long taproot. It is difficult to transplant trees that are several years old, and whenever possible transplanting should be avoided by planting the nuts where the trees are to remain permanently.

WALNUT LEAF
About one-third natural size

DOGWOOD

The dogwood, although of little use for timber, is a beautiful sight in May when the flowers appear. The large, white, showy "flowers," so-called, are not the true flowers, but are really floral leaves surrounding the true flowers, which are relatively inconspicuous. This tree never occurs in great numbers, but it is found scattered throughout the woods and always occupies a humble position. The opposite, wavy-margined leaves, which have prominent veins, are a means of recognizing the trees in summer; while the pointed terminal buds form a mark by which the tree may be distinguished in winter. The wood is hard and close-grained, and takes a fine polish; for this reason it is used sometimes for tool handles or other turned articles, for the hubs of small wheels, or for engravers'

blocks. The fact that the tree never attains a large size prevents its becoming generally useful, and it is therefore prized chiefly for its ornamental qualities.

MAPLES

The maple family is large, containing many trees that are not only useful but also ornamental. In fact, most of the maples are valued chiefly because of their beauty of foliage. About thirteen kinds are considered native to the United States, but by far the greatest number of the maples are native to Asia and the islands bordering that continent.

Many of these foreign maples — some of them trees and some of them shrubs — have been planted in this country and are common in parks

DOGWOOD

and gardens or along city streets. Maples are noticeable chiefly, perhaps, because of their foliage. Whether the individual leaves of a silver maple or the whole mass of foliage as it appears on a large sugar maple is considered, the leaves are beautiful. The little, tender leaves of the soft, or red, maple, when they burst from the buds in April, are rich and warm in coloring; and what boy or girl who has been in the country during the month of October does not know the brilliant colors for which the maples are famous then! Reds, golds, and yellows seem to flood the autumn air with a warmth and light which adds life to it.

The maples that one may expect to find in New York State are:

1. Sugar, or hard, maple
2. Red, or soft, maple
3. Silver maple
4. Mountain maple (a shrub)

5. Moosewood, or striped maple (a shrub or a small tree)
6. Box elder, or ash-leaved maple
7. Norway maple (not native, but commonly planted)
8. Sycamore maple (imported)

The sugar maple, which is commonly found, is the largest and finest of the family. In deep woods where it grows with beech, birch, basswood, hemlock, ash, and other trees, it often reaches a height of more than one hundred feet and has a trunk perhaps four feet in diameter, which rises straight and full without a limb for more than half the height of the tree. Such a tree is in great contrast to sugar maples growing along the roadside, which are shorter and large-crowned, and which have so many branches that it is difficult to find any one stem that seems to be the leader. The wood of the sugar maple is heavy, hard, and close-grained. It is used for furniture, flooring, and many small wooden articles. It also makes one of the best firewoods that the forests produce. The custom of making sugar and sirup from the sap of this tree is well known.

The sugar maple can be distinguished by its leaves in summer and by its buds in winter. The lobes of the leaves (of which three are usually very conspicuous) are separated by U-shaped depressions, or sinuses, in the case of the sugar maple, and by V-shaped sinuses in the red maple. The buds of the sugar maple are long, pointed, and brown, while those of the red maple are shorter, rounded, and red. These marks will serve as a means of identification at any time of the year. The other members of the maple family all have some interesting characteristic that will be worth discovery by the boys and girls. The winged fruits of the maples are perfectly familiar, and will help to identify the less well-known species.

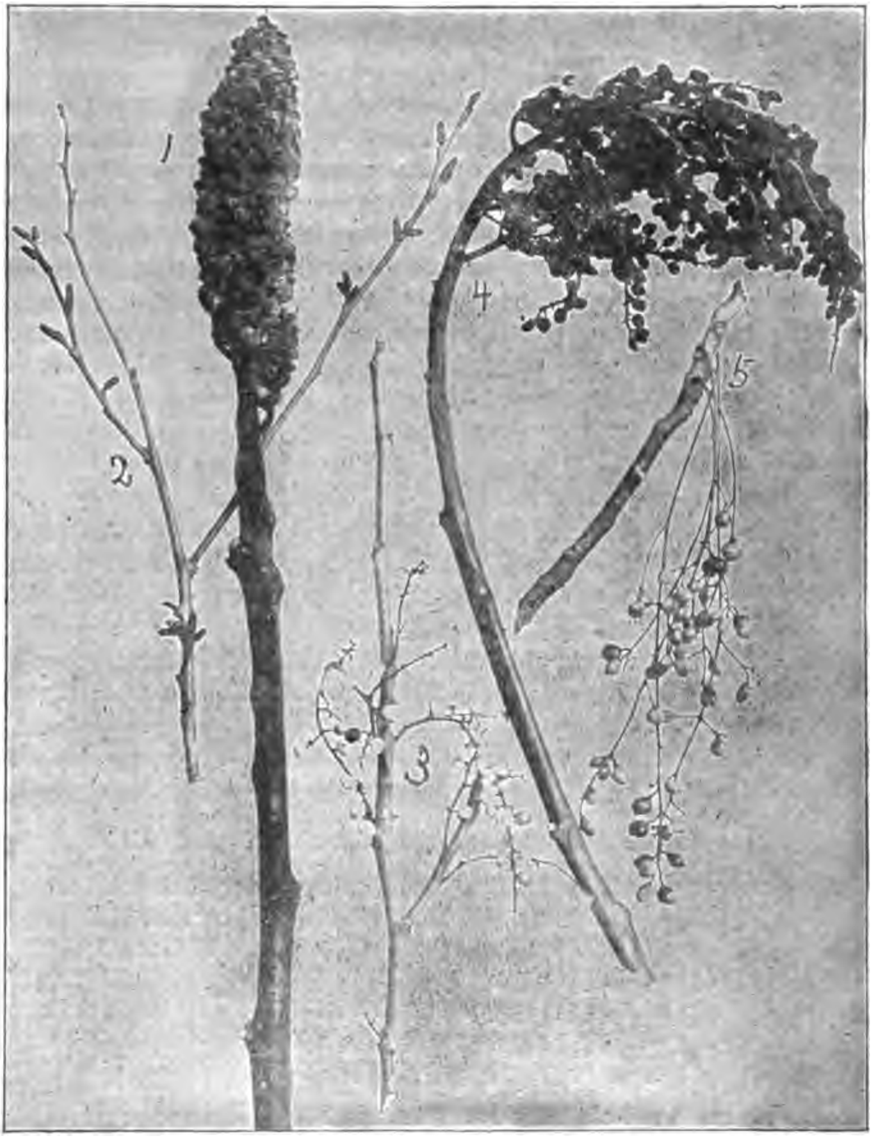
SUMACS*

The staghorn sumac is a large shrub, with velvety-hairy branches. The fruit, or seed part, is terminal — that is, on the ends of the branches — and is composed of a dense cluster of red, hairy berries.

Smooth sumac is often a large shrub, but the branches are smooth. The fruit is terminal, like that of the staghorn sumac, but it does not make such a stiff, dense cluster.

Poison sumac, or poison elder, is also a large shrub, but it grows only in swamps or moist places. The twigs are mottled brown-and-gray. The fruits are round, waxy berries (dry and hard in winter), borne in loose, slender clusters which, instead of being terminal, are axillary, that is, growing out of the sides of the branch in the axils of the leaves. If the

* The material on sumacs is the work of Ralph W. Curtis, Professor of Landscape Art.



FRUIT AND TWIGS OF THE COMMON SUMACS

1, staghorn; 2, fragrant sumac; 3, poison ivy; 4, smooth sumac; 5 poison sumac

leaves have fallen the leaf scars are still there and are big and broad, not narrow and circular like those of the staghorn sumac.

Fragrant sumac is a low shrub. The fruit is in small clusters of red hairy berries which fall off early in winter. The small clusters on the present twigs are next year's flowers, which open very early in spring before the leaves. The wood is sweet-scented.

Poison ivy, or poison oak (a true sumac and by far the most common poisonous plant in the United States), is a low shrub or climbing vine, with light brown twigs. The fruit is like that of the poison sumac, and the leaf scars, in proportion to the twig, are also similar.

OAKS

There are nearly fifty different kinds of oaks in the United States, and if we should include the several varieties, some of which are indistinct, the list would be so long that it would be discouraging to try to learn all of them. Fortunately we can learn to distinguish those that are common in New York. Although there are some fifteen or sixteen kinds of oaks reported as growing in this State, we shall describe but ten. The others are rare or of very local occurrence. It will be necessary to have not only the leaves, but the acorns and sometimes the twigs and the winter buds, in order to distinguish all the oaks described.

In the first place, we can divide the oaks into two general groups: those that have acorns maturing in *one season*, known as the *white oaks*; and those that have acorns maturing in *two seasons*, known as the *black oaks*. A further distinction between these two groups is that the black oaks have leaves the lobes of which are tipped with bristles, while the lobes of the leaves of the white oaks are smooth and rounded. Between the lobes are indentations which botanists call "sinuses." These sinuses are variable and are often a help in identifying the different species. On pages 188 and 189 is given a key for identifying the different species of oaks. Note the use of the term *sinus* in this key.

As a family the oaks are very useful; but there is a great difference between the several species, especially as to rate of growth, hardness of wood, and usefulness of wood. In general the white oaks are harder and more durable than the black oaks, and when a carpenter or a woodworker wants a piece of very hard, heavy, durable wood that will hold its shape without shrinking, warping, or checking, he will be likely to choose a piece of white oak in preference to any other kind of oak. In the market, swamp white oak passes for white oak and sometimes a small quantity of chestnut oak may be included with true white oak; but the wood of chestnut oak is not so strong and good as that of true white oak.

In form the oaks present a great variety. White oak growing in the woods has a long, clear stem for perhaps fifty or sixty feet and reaches a height of over one hundred feet. In the open fields, where it has plenty of room to develop a big crown, the form is likely to be short and round-headed, with a stout trunk and with little of it clear of branches. The oak always presents an appearance of great strength and sturdiness; the winds of winter have little effect on its tough, strong branches but these are in many cases gnarled and irregular as a result of exposure to storms. The acorns of the white oak will germinate soon after falling

WHITE OAK

in autumn if the conditions are favorable; but because so many acorns are eaten by squirrels, and because so many others do not find the right conditions of soil and moisture, only a small number succeed in growing to a size that will enable them to live over the first winter.

Although a widely distributed tree, the white oak is found most commonly on good moist soil in rich bottom lands or in protected hollows. In the country adjacent to the Ohio River valley the white oak finds the best conditions of soil, climate, and rainfall. It will grow also on rather dry, stony soil, but it never reaches such good size under these conditions.

Of the black oaks, the common red oak is the most desirable because of the rapidity of its growth and the general quality of its wood. Although

not nearly so strong as white oak, it is heavy and rather hard and is useful where great strength is not required. The grain of the wood is rather coarse and it never seasons so well as does the white oak. In form the red oak develops a very large, wide-spreading crown, with a number of large branches; but it almost always has a well-formed stem, making possible the cutting of good saw logs from it. The red oak grows farther north than any of our native oaks, and is not nearly so particular as the white oak as to quality of soil.

The common black oak is of relatively little importance. The tree does not grow to such good proportions as the red oak and the wood is poorer in quality. It is used for railroad ties and rough timbers, but it is not so durable as the red oak.

RED OAK

The scarlet oak is a much smaller tree than either the red or the black oak and it is almost always found growing on sandy or gravelly soils. Its form is not good enough to make it an important timber tree.

The two scrub oaks, which are really little more than shrubs, cover vast areas that have been burned over and are often the obstacle to having better trees on this kind of land. It is better, however, to have them growing on the land than to have nothing at all, for in the latter case the soil might be washed away by heavy rains; and perhaps we shall be able to start more desirable kinds of trees where the scrub oaks are now growing, taking advantage of the protection that they afford.

KEY TO THE COMMON OAKS OF NEW YORK

A. Acorns maturing in one season; leaves with rounded lobes and rounded sinuses .... WHITE OAKS

1. Margin of leaf merely wavy-toothed, not cut so deeply as to be called lobed
   - (a) Margin finely wavy-toothed .... Chestnut oak
   - (b) Margin coarsely wavy-toothed, more pointed than in (a) .... Swamp white oak
2. Margin of leaf distinctly lobed; one pair of broad sinuses cutting nearly to the midrib of the leaf, so that the upper part of the leaf is much heavier and broader-looking than the lower part. Acorn with a mossy cup .... Bur oak, or mossy-cup oak
3. Margin of leaf distinctly lobed sometimes very deeply cut, with broad sinuses
   - (a) Lobes usually seven or nine in number; acorns pointed; cup enclosing not more than one-fourth of the nut .... White oak
   - (b) Lobes usually five in number; acorns not so pointed; cup enclosing one-third to one-half of the nut . . Post oak

AA. Acorns maturing in two seasons; leaves with pointed, bristle-tipped lobes and rounded sinuses .... BLACK OAKS

1. Leaves green on both sides
   - (a) Sinuses very broad, broader than the lobes between them
     - (i) Acorn small and flat, the nut almost hemispherical. Usually found growing in moist, rich soil on the banks of streams or the borders of swamps .... Pin oak
     - (ii) Acorn slightly larger and more nearly round. Kernel whitish. Usually prefers dry soils on ridges and well-drained situations. . . . Scarlet oak
   - (b) Sinuses usually not so broad as the lobes between them
     - (i) Leaves thick and firm; dark green, lustrous above; more or less fuzzy on the under side. . . Black oak
     - (ii) Leaves thin and firm; dark, dull green above; on the lower side usually smooth, or with fuzzy hairs near the veins only .... Red oak

       Or by their acorns these two oaks can be distinguished as follows:

       Cup very flat, saucer-shaped .... Red oak

       Cup not so flat, enclosing nearly half the nut .... Black oak

2. Leaves green above; gray-green or yellowish green and scurfy on the lower side; usually with only three lobes. (Found only on Long Island) .... Blackjack

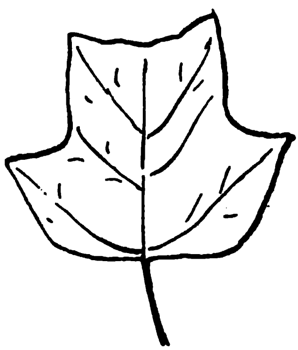
FIR

The balsam fir is one of the most attractive conifers. It is prized because of the odor that comes from the aromatic gum in its leaves and buds. It resembles the Norway spruce, but can be easily distinguished from the latter as follows:

	BALSAM FIR		NORWAY SPRUCE
Bark......	Light gray; blisters which contain resin, called Canada balsam, on bark	Bark......	Reddish gray; no resin blisters
Cones.....	When young, dark purple; later, brown. Stand erect on branch	Cones.....	Long, light brownish yellow. Hang down on branches
Needles...	Flat, a light gray streak on the under side	Needles...	Four-sided

TULIP TREE

The tulip tree is one of the stateliest and most magnificent of all our native American trees. In the southern mountains, where it reaches its finest development on rich, moist soils of protected slopes, it is not uncommon to find the tulip tree (or yellow poplar, as it is called there) growing to a height of one hundred and sixty feet and a diameter of six feet. Its trunk is often so straight and clear of limbs that a large amount of valuable lumber is obtained from a single tree. Notice the leaves of the tulip tree as shown in the drawing; did you ever see a leaf that resembled this at all? Probably not, for this tree is one of two species which are relics of ancient times. The other species is found in China.



LEAF OF TULIP TREE

The beautiful flowers of the tulip tree appear immediately after the leaves unfold. They resemble tulips, from which fact the tree takes its name, but they do not last long. The fruit looks somewhat like a cone.

The seeds that it bears are unfortunately very poor in vitality, so that, although many seeds may be distributed by the tree, only a few germinate and the tulip tree is therefore not so common as we should like to have it. Wherever it is found it should be protected and encouraged.

The tulip tree yields a very high grade of lumber. It is soft, easily worked, and unusually free from knots. It is much used for interior finish. Much of the timber has been exported to Europe from even the most inaccessible parts of the southern mountains, the wide boards from large trees being in great demand.

FRUIT TREES FOR RECOGNITION IN 1918-1919

PEACH

H. B. Knapp

Formerly Assistant Professor of Pomology

The apple has been called the king of fruits, and justly so because of its popularity and widespread use. If the apple deserves this title, then the peach is just as surely the queen of fruits, possessing the qualities of beauty, tenderness, and luscious flavor to a degree that no other of the northern fruits can boast. It is an old, old fruit, originating either in Persia or, more probably, farther eastward. The species name, *persica*, is derived from Persia, where it was long thought that the peach was first grown. There are several groups of peaches now grown in this country, just as there are several groups of cherries. These groups differ in size, shape, and flavor of the fruit, and in the manner of growth of the tree. Only two of these groups are of commercial importance in New York State: the North China group, to which the Elberta belongs, and the Persian group, of which the Crawford is an example.

The peach is the tenderest of all the commercial fruits. It can be grown with the greatest success only in the more favored sections of the State, namely, those regions in which the climate is tempered by nearness to large bodies of water. For example, the Ontario Lake region of New York State is recognized as one of the foremost peach-growing sections in this country. This does not mean that the peach may not be grown in less favored sections of the State, but it does mean that it will require more attention in those parts because it is not naturally adapted to them. On the whole, to grow this fruit successfully requires more care and skill than to grow any other of the orchard fruits. It is very susceptible to cold, to fungous diseases, and to the attacks of insects. It is wholly intolerant of sod or grass, and, unlike the cherry, it is a decided failure when planted in an out-of-the-way corner of the garden and left to shift

for itself. The peach will thrive in proportion to the care bestowed on it; for while some fruits will thrive in spite of lack of management by the grower, this is not true of the peach.

The peach is grown on a variety of soils, and the types on which it succeeds best are more definitely known than in the case of any other fruit. A soil that is light and warm, such as a sandy or a gravelly loam, gives best results. The peach does not thrive in wet soil, and those just mentioned are, of course, well drained by nature. The peach is sometimes grown on heavy soils, but the fruit is less likely to mature at the proper season. In addition, the tree often makes wood growth at the expense of its fruit-bearing habit, and in many cases the wood is not mature when cold weather sets in.

A YOUNG PEACH TREE

The best time to plant the peach is in the spring. If planted in the fall, it is very likely to succumb to the cold of winter. The land, which should have grown a cultivated crop the previous year, should be plowed and put into condition for planting just as early in spring as possible; for the earlier the tree is set, the better is its opportunity to become established before dry weather arrives. The trees are commonly set twenty feet apart, although at the present time many fruit growers are planting them twenty-two feet apart. The peach tree is always set when one year old. At this age it will be four to six feet tall, with a number of side branches. These branches are usually pruned off when the tree is set, and the top is cut back to three feet or less in height. The peach is headed much lower than are other tree fruits; and the closer to the ground one desires the head, the shorter should be the whip that is left when pruning. The top is usually cut back and thinned out rather severely each year, as the productivity of the tree depends on the stimulation of new growth.

All the fruits thrive best if given good cultivation, but none is such an absolute failure when left in sod as is the peach. In this condition the vitality of the tree is so weakened that it becomes an easy prey to insect enemies and fungous diseases. The life of the peach tree is short at best, being about twelve years, but if grown in sod it will not last more than five or six years.

The ground about the trees should be plowed in early spring and cultivated every week or ten days until late July or early August. At this time a cover crop should be sown, to remain on the ground during the ensuing winter and to be plowed under in the spring. This cover crop may be rye, vetch, or some of the clovers. The cover crop affords one of the best inexpensive means that there is of furnishing fertilizer to the trees, and in some cases it may furnish all the plant-food necessary if the land is rich naturally. Oftentimes, however, commercial fertilizers are needed in addition. The amounts to be applied can be determined only by actual experiment.

The peach tree begins to bear fruit when three years old, the average yield at that time being about one-third of a bushel. With good care the yield will usually increase until the tree is ten years old. At this time the production of each tree will be in the neighborhood of three bushels. These figures will, of course, vary with the varieties and the conditions under which the fruit is grown. The fruit-bearing habits of the peach differ from those of other tree fruits in that all the fruit is borne on wood of the previous season's growth. This is sometimes called one-year wood. The upper and lower parts of the previous season's growth usually contain single buds. These are leaf buds. In the central part of the branch, however, the buds are generally in clusters of three. The central buds of these clusters are generally leaf buds, while the outer ones are fruit buds, each containing a single blossom. It is often the case that only a small proportion of these buds develop sufficiently to bear fruit. It is well that this is so, because if all the fruit buds that form each year were to produce fruit, the trees would be overloaded and considerable time and money would have to be expended in thinning the fruit. Even as it is, the growers of fancy peaches thin the fruit each year.

It will probably be necessary to spray the peach. Insects and diseases will vary with the different sections and with the conditions under which the fruit is grown. For information on these subjects, a publication devoted to their treatment should be consulted.

It is not possible to recommend varieties for planting with any assurance that they are the best varieties for the purpose, without first knowing the conditions under which they will be grown. Persons are likely to feel that those fruits which are grown at a considerable distance and are

unknown in their own community are superior to those found at home; but the safer way is to plant those varieties that have proved suitable for local conditions.

The peach is one of the finest fruits and should be found in every home garden where the tree will grow. It will not thrive without care, but it will repay the caretaker for the time spent on it.

PLUM

H. B. Knapp

Formerly Assistant Professor of Pomology

The plum is one of our most difficult fruits to study — difficult from the fact that the species and varieties of this tree are so numerous and so mixed by crossing that it is not easy to describe and classify them satisfactorily.

This is perhaps one of the least popular of our tree fruits. The fruit is used largely for canning, and in certain parts of the United States the drying of one type of plum, the prune, has become an industry of considerable importance. We commonly speak of the prune as being a more or less distinct fruit, but in reality it is a plum with flesh thick enough and firm enough to give a satisfactory product when dried.

Almost all our cultivated plums have come from Europe, although their native home was probably western Asia. Among these plums may be mentioned Lombard, Reine Claude, Bradshaw, and the Damsons. The Japanese types of plums are also grown largely now, but these varieties are of only fair quality. The quality is usually improved greatly by severe thinning of the fruit, because the trees are likely to over-bear. Two of the most common varieties of Japanese plums are Abundance and Burbank. In addition to the plums mentioned here there are many other types and species, some of them native to this country. These native plums apparently afford an important field for the improvement of our present-day varieties both in quality and in hardiness, and indeed it will not be surprising if future generations develop them to such an extent that they largely replace those which have come to us from other lands.

The plum will succeed on a fairly heavy soil that is not wet. A good pear soil is in many respects a good plum soil, while the soil that is most favorable for peaches is a little lighter than that on which most varieties of plums thrive best. The Japanese varieties prefer a lighter soil than do the other varieties. The axiom which might be laid down, that fruit trees should never be planted in sod or on sod ground, holds true in regard

to the plum. Next to the cherry it will thrive in sod better than will other tree fruits, but this does not mean that the plum will not respond to proper treatment when it receives it.

The plum is commonly planted in spring, although in milder sections of the State it may be planted with safety in the fall, provided the land is well drained and the trees are mature when dug at the nursery. Both one-year-old and two-years-old trees are used, although most of them are of the latter age.

The distance of planting will vary somewhat with the varieties and with the richness of the soil. The trees should be not much less than twenty feet apart. The grower is more likely to set them too close than too far apart. Pruning in the first year should consist of removing all but three or four branches that are so distributed as to make a well-balanced top. These branches will later become the framework of the head of the tree. The plum does not require so much pruning as do some of our other fruits, nevertheless attention should be paid to this each year. If done properly and if the branches are taken out when they are small, little pruning will be necessary when the tree reaches maturity. The soil should be worked with a plow or a harrow in the same manner as for other orchard fruits.

Most plums bear fruit on wood that is two years or more old. Fruit buds are formed on dwarf branches, known as fruit spurs. The Japanese varieties, however, and to a certain extent some of the other varieties, bear fruit from buds on one-year wood. It is usually well to thin the fruit.

The most serious pest of the plum is the curculio, which stings the fruit, causing it to drop to the ground. This may be partly controlled by deep cultivation in July and August, which helps to destroy the insect while it is passing part of its life in the ground; but a better means is to thoroughly spray with arsenate of lead, six pounds to one hundred gallons of water, just as the shucks, or withered blossom parts, are falling from the fruit.

The average life of the plum tree is in the neighborhood of twenty-five to thirty years, although it will live longer if grown under conditions especially suited to it. Many varieties of plums will succeed in New York State, but it is always best to plant the varieties that are known to succeed well under local conditions. Among the most popular and satisfactory varieties are: Bradshaw, Reine Claude, Italian Prune (or Fellenburg), Duane, Lombard, Shropshire Damson, and Grand Duke. The Damson plums are used for preserves and the like. Two of the most widely grown Japanese plums are Abundance and Burbank. The Burbank is preferable for the home garden, but neither of these varieties is entirely hardy in the colder sections of the State. Some variety of plum can be grown

in nearly every part of New York State. The essential factor to be kept in mind is to choose the varieties best adapted to the conditions under which they are to be grown. It is much better to consult with a neighbor who is growing plums successfully than to heed the advice of the tree agent.

APPLE

PRUNING APPLE TREES

E. L. Overholser
Formerly Assistant Professor of Pomology

Editor's note.— A very complete series of lessons on the apple was published in the September 1916 number of the Cornell Rural School

CUT MADE IN THE RIGHT WAY
The wound at A is entirely covered with new growth

Leaflet. Teachers desiring to do special work with this important fruit should refer to that material.

Pruning may be defined as the removal of a part of a plant for the purpose of improving the remaining part or its product. Lindley, a noted English horticulturist who lived many years ago, said: " If well directed, pruning is one of the most useful; and if ill directed, it is among the most mischievous operations that can take place on a plant."

Objects of pruning.— The ultimate object of pruning is not merely to remove wood but to remove wood for a definite purpose, that is, to obtain the largest quantity of first-class fruit year after year.

The immediate objects of pruning bearing trees are as follows: (1) to remove dead, diseased, broken, or weak limbs; (2) to remove interfering

branches, which shade too much, or which rub one another, or which grow back into the tree; (3) to maintain a size and a shape of tree that admits of easy spraying and harvesting of the fruit; (4) to keep the top somewhat open, and to admit a certain amount of sunlight to all parts of the tree; (5) to maintain the vigor, and to keep a proper balance between vegetative growth and fruitfulness.

Fundamentals of pruning.— 1. The method, or system, of pruning will vary for different localities or different parts of the country. In a humid or foggy climate, apple trees would be pruned to a more open type of head than in a very sunny, dry climate.

THE WRONG METHOD OF MAKING CUTS
Contrast this method with that shown in the illustration on page 197

2. Different varieties of apples may be pruned somewhat differently, according to the habit of growth.

3. Pruning at any season of the year tends to dwarf the tree. Summer pruning is more of a dwarfing process than winter pruning. The earlier the pruning is done in the summer after growth starts, the more marked is the dwarfing, due to the fact that the leaf surface is reduced and less food is manufactured by the leaves.

4. Heavy winter pruning of the top tends to increase the vegetative growth and causes the growth to continue later the following summer. There is not, however, enough increase in length of growth to make up for the amount cut off plus the amount that would have been normally made if no pruning had been done. With young trees, heavy winter pruning, with the resulting late growth the following summer, is likely to prevent the trees from properly maturing, and as a result injury by cold the next winter may follow.

5. On mature, bearing trees and particularly on neglected trees, pruning tends to increase fruitfulness. Any considerable amount of pruning on young trees, however, will tend to delay the time they will come into bearing and to reduce fruitfulness.

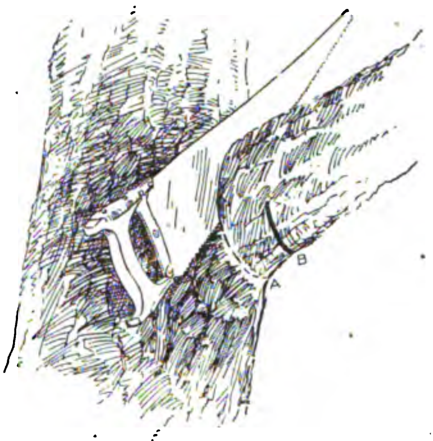
6. Summer clipping back of the branches of bearing trees tends to induce fruitfulness on the branches clipped back. This does not apply to the cutting out of branches.

Time to prune.— The question as to the best time to prune is often answered by the old saying, "Prune when your knife is sharp." The proverb carries considerable truth with it, but in practice the best time to prune is during the dormant season.

There seems to be no danger of failure of wounds to heal when branches are removed in early fall. There is apparently no danger of injury to the tree as a result of pruning while the wood is frozen, provided the work can be done comfortably in so low a temperature. Branches can be removed from the apple tree in the spring after the growth has started without any danger of bleeding or loss of sap with a consequent reduction in the vitality of the tree. There is no reason why a few small shoots and branches could not be cut out even during the summer.

How to make a cut.— In pruning a mature orchard, it is necessary to remove some of the larger branches. The method of removing such branches is important inasmuch as improper cuts lead to decayed branches and eventually to decayed and broken trunks.

The cut should be made as close as convenient to the parent branch. In no case should a long stub be left. It is much easier to cut the branch several inches from its source than to cut it close, but the tree is unable to heal the wound where a stub is left, and decay soon begins. Not only does the stub decay, but the rot extends back into the branch to the center and finally makes a hollow limb.



METHOD OF CUTTING LARGE BRANCH TO AVOID SPLITTING

The line at A represents the final cut; the line at B represents the first cut

If, however, the cut is made close to the parent branch and parallel with it, the wound will heal rapidly. A perfect healing seals the wound from fungous and bacterial diseases, and there is no danger of decay. The greater number of hollow limbs and trunks of trees in the orchards at the present time, are due to improper methods of pruning.

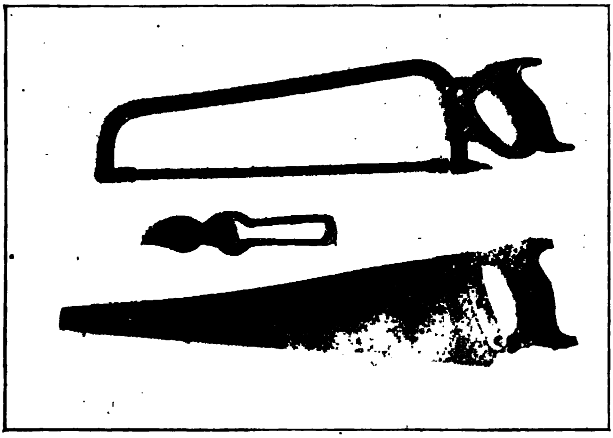
In cutting the larger branches, care should be taken to keep them from splitting on the under side. This can easily be avoided by sawing a short distance up from below before starting to saw from above.

Painting the wounds.— All wounds that are more than one and one-half inches or two inches in diameter should be covered with some coating to prevent decay while the wound is healing. Coal gas tar or thick white

lead paint can be used to paint the wounds. The covering should be worked in around the edges of the bark and the wound. Wounds are not painted to hasten healing; they are covered to prevent decay during healing.

Pruning tools.— A suitable outfit for pruning may well consist of one or possibly two good saws of different sizes, a good pair of hand pruning shears, and a knife.

Two types of saws are used in pruning, as shown in the illustration. A saw similar to the lower one is in most common use in the East and is the type generally recommended. The writer feels that the upper one is a handier saw except for very large trees. The blade is stretched between swivels and can be turned to any angle. It is well adapted to close work in the crotches of the tree.



PRUNING TOOLS

A good pair of shears of the type shown in the illustration on this page, will be found most useful. They are chiefly valuable on young trees up to six or seven years of age.

Systems of pruning.— There seems to be no agreement as to which is the best system of pruning. In fact, there is no best system for all varieties.

There are three chief systems of shaping the apple tree, known as (1) the open-head, or vase-formed; (2) the pyramidal, or central-leader; and (3) the natural.* It would be a very interesting study where there are older pupils and where several young apple trees could become the school property, to take three trees of a given variety and prune them according to the three systems. Then observations could be made first-hand of their development and of the effect of the pruning on that variety. A study of the pruning operations of the growers in the neighborhood should also be made in this connection.

Almost any boy or girl who is really interested will be able to find an opportunity to become responsible for an apple tree somewhere, and can carry out the various operations that are involved in its culture. One of the most important of these is pruning.

* A discussion of these systems and their relative merits is given in *Pruning*, by W. H. Chandler and H. B. Knapp, Cornell Reading Course for the Farm, Lesson 104. Any school interested in pruning should write to the College for this publication.

TREE QUOTATIONS

A thousand miles of mighty wood,
Where thunder storms stride fire-shod;
A thousand plants at every rod,
A stately tree at every rood;
Ten thousand leaves to every tree,
And each a miracle to me,—
Yet there be men who doubt of God!

By JOAQUIN MILLER

TREE PLANTING

What do we plant when we plant the tree?
A thousand things that we daily see;
We plant the spire that out-towers the crag,
We plant the staff for our country's flag.
We plant the shade, from the hot sun free;
We plant all these when we plant the tree!

By HENRY ABBEY

ELM

Where mellow haze the hill's sharp outline dims,
Bare elms, like sentinels, watch silently,
The delicate tracery of their slender limbs
Pencilled in purple on the saffron sky.

By ELIZABETH AKERS

PINE

Softer than silence, stiller than still air,
Float down from high pine boughs the slender leaves.
The forest floor its annual boon receives,
That comes like snowfall, tireless, tranquil, fair.

From *The Snowing of the Pines*
by THOMAS WENTWORTH HIGGINSON

APPLE

"Who planted this old apple tree?"
The children of that distant day
Thus to some aged man shall say;
And, gazing on its mossy stem,
The gray-haired man shall answer them;
"A poet of the land was he,
Born in the rude but good old times;
'Tis said he made some quaint old rhymes,
On planting the apple tree."

From *The Planting of the Apple Tree*
by WILLIAM CULLEN BRYANT

DOGWOOD

In ways untrodden oft I strayed
Long since your crowding ranks to see,
That glimmered down the dusky glade,
Fresh blown, bright tree.

By DORA READ GOODALE

MAPLE

And oh! the sun, the flooding, golden sun!
The roof trees pour their floods beneath its beams,
And from the maples come the gay drip-drop
Of sap on every hand in limpid streams.

From *In the Sugar Camp*
by FRED LEWIS PATTEE

OAK

A song to the oak, the brave old oak,
Who hath ruled in the green wood long;
Here's health and renown to his broad green crown,
And his fifty arms so strong.

By H. F. CHORLEY

TULIP TREE

The tulip tree, high up
Opened in airs of June, her multitude
Of golden chalices to humming-birds
And silken-winged insects of the sky.

By WILLIAM CULLEN BRYANT

PART II

HOME MAKING

THE EDITOR

TEACHERS are finding ways to consider in the school various questions that relate to home making and our lives in homes. It is often done in a very informal but no less effective way. The preparation of a warm dish for the noon lunch, a little group of girls engaged in sewing, the decoration, arrangement, and daily care of the schoolroom — all offer starting points that lead naturally to larger things.

Even very little children can begin to think about the care of a home and its effect on those who live there, can begin to see the reasons back of certain practices, can begin to form right standards if only by imitation. Certainly the field of home making is rich in opportunity for educational growth. After all, in one sense, we are educating boys and girls for home making.

The most important home problem to-day is that of food. This has come largely through the world crisis that has disturbed normal food conditions, but always such matters as properly balanced meals and proper preparation of food confront us. The material on foods given in the following pages has been prepared and furnished by the Bureau of Conservation of the New York State Food Commission. Teachers will find not only a statement of the food situation that will be valuable as a background, but also suggestions and menus and directions for preparing dishes of various kinds, many of which can be worked out through the schools. Just how this is to be done in individual cases must be left to the ingenuity of the teacher, who will select from the material given those things that best fit the local condition.

The articles given deal with the following subjects: the world food situation, selecting balanced meals, school lunch menus, stand-bys for children, milk and milk dishes, fireless cookers. The subject of food offers a rare opportunity for the school and the home to come together more closely with mutual benefit.

Following the work on foods is a series of articles describing various simple pieces of wearing apparel suitable for preparation by children in

elementary schools. These are designed to reenforce and apply the principles given in the September 1917 leaflet regarding hand sewing. Reference should be made to that leaflet for instructions in the various stitches and operations mentioned in this new material.

Other phases of home making that teachers may emphasize are sanitation, personal hygiene, and household decoration and management. The schoolroom itself offers many opportunities to illustrate these principles. The food and clothing phases are most important, however, and it has seemed wisest to confine the material to them this year.

Rural teachers who are interested in home making should keep in touch with the Department of Home Economics at the New York State College of Agriculture, so that they may receive reading course lessons and special circulars issued from time to time.

FOOD

Bureau of Conservation, New York State Food Commission

THE WORLD FOOD SITUATION

With the Allied pantry low in food to the point of undernourishment, even to starvation for many, these alternatives faced us: either to continue eating and wasting as we had formerly, and let the Allies starve; or to raise more, eat less, save more, and share the surplus with our neighbors abroad. The alternative was really no alternative. We will, of course, produce, save, spare, and share.

What has actually happened is that we have adopted or partly adopted a family that more than doubles our own, a family of one hundred million women and children plus all men in uniform on the Allied battlefields of Europe.

Why we have had to adopt that large family is almost too obvious to need explanation. They are fighting our fight, men, women, and children, and it was our fight even before we came into the arena. They cannot fight and provision themselves abundantly at the same time. Those thirty million men were in large proportion taken from the fields and from trades administering to the preparation of foods. In the French army alone, numbering six or seven million, it is estimated that there are from four to five million agriculturists. Add to the withdrawal of these men from production, the fact that they consume a daily average of from thirty-five to forty per cent more food than is their custom, and at once there appears the need of an increased supply of food.

America is the only large food-producing country far enough beyond the range of warfare to keep her production conditions stable and yet near enough to be within practical shipping distance. This is why

America is the logical food station for the Allies and for the sympathetic neutrals. England, whose fields are not plowed with shells, has pressed her production to the highest point, but she has the smallest territory and is normally the heaviest importer of foods of the important Allied countries. Likewise her men are in the trenches.

Fertile, thrifty little Belgium is for the time being Germany's agricultural serf. France, from French Flanders to Switzerland, through the heart of one of the most productive sections, is sown with barbed wire instead of wheat. Russia, one of the heaviest exporting countries, is too demoralized to be able to feed even her own army and peasants. The wheat fields of the Balkans, of the Ukraine, and most of Roumania, have fallen into the hands of the Central Powers.

This war will not be won in Flanders, in the Balkans, or on the heights of the Alps, solely through military genius. It will be won in the homes, in the factories, in the shipyards, by the side that can assemble the largest supply of food, of ammunition, and has at its disposal the largest number of ships and railways to transport them. The submarine has destroyed shipping to such an extent that every ship must be used to the greatest advantage. The transportation situation of the world has been interrupted. Certain productive countries are absolutely cut off from contributing food to the Allies because there are not ships enough to travel to them, and because it would take too many battleships to police the routes to their ports. There is wheat in Australia, in Argentina, and in India, but the route to those countries is three times as long as that to America and it is more than three times as perilous a trip. Therefore wheat must remain there, as far as the Allies are concerned, until after the war. The law of supply and demand has been turned topsy-turvey by this clogging of the world passages of commerce.

WHY THE WORLD NEEDS WHEAT

There are three main staple foods that the war has seriously affected: bread grains, especially wheat; animal products, meats, fats, and milk; and sugar. Broadly speaking, this is because these are the staple articles of food that enter most largely into import and export, the foods that are exchanged among the nations of the world. But there are other reasons contributing to the scarcity of these foods.

Wheat, the great staple export of the world's food, is the article on which war puts the highest premium. Experience has proved that with a sufficient bread ration, much elimination and substitution of other foods can be done. Before the war, France, Italy, and Great Britain all produced large amounts of wheat, but they imported three times the amount of their exports. Russia, in the three years' average before the war, led

the world in wheat production, consuming five-sixths of what she produced and exporting the rest, but Russia is wiped off the map as far as contributing in food to the Allies. The wheat fields of Belgium and Roumania and part of the wheat fields of France are in the hands of Germany and Austria.

As long as the war lasts, the wheat situation is likely to be acute. The 1917 crop in this country was below the average. We gave what we could by reducing our consumption far below normal. We shall probably have to conserve wheat as long as war interrupts normal shipping and normal agricultural conditions in Europe. With the large crop of other grains raised in this country — corn, buckwheat, oats, rye, barley — it is just a matter of substitution of one of these for wheat in our accustomed diet.

WHY WE MUST SAVE MEAT

The consumption of meat in the Allied countries has greatly increased since the war began because of the meat diet of the soldiers. The number of cattle, sheep, and hogs in these countries has diminished by thirty million animals, with the reduction continuing constantly at an increasing rate. The normal source of import is America. That is why we need to save meat. Moreover, we have seven million fewer meat animals in the United States to-day than we had seventeen years ago with twenty-six million more people. That is another reason why we need to save meat.

There are various causes entering into the slaughtering of the herds of the Allies. They have not been able to afford to plant large areas of fodder, because the acreage was more needed for bread grains; therefore they have to depend very largely on imported stock feed. And the amount of tonnage necessary to import fodder is so largely in excess of the amount of tonnage to import animal foods that it has been economy to kill off their cattle and import meat from other countries. It has been a choice between feeding humans and feeding cattle, and cattle have had to go. Another reason is the shortage of labor to care for cattle, with the man power of the countries in the trenches.

Due to the killing off of cattle, the world is lower in animal fats than it has ever been, with, on the other hand, an increased need of it because of the increased human energy required by the soldiers and necessitated by the additional speeding up of the industrial machinery. "Every pound of fat is as sure of service as every bullet," says Mr. Hoover. Hogs are, fortunately, one of the animals quickly produced, and that is the reason back of the "Keep-a-pig movement" in this country.

THE WHEREFORE OF THE SUGAR SHORTAGE

Sugar was one of the first staple foods that war cut off. The reasons were very much the same as for the scarcity of wheat, that is, disorganiza-

tion of the sugar-bearing lands, upsetting of world commerce, and the interruption of world shipping. England, the next largest sugar-eating country to our own, got one-third of her sugar before the war from Germany and Austria, a supply immediately cut off with the declaration of war. Germany, Russia, and Austria-Hungary produced considerably more than half of the total beet sugar of the world, and a third of the total sugar supply. The sugar beet area of Belgium and part of that of France, both large sugar beet producers, passed at once into the hands of Germany. There has been a decline of sugar beet production in Russia since the war, so that during the year just passed, she did not even produce enough to supply her own needs.

A large percentage of the cane sugar production is in Cuba, India, Java, and Hawaii, but part of that is difficult or impossible to procure on account of the shipping. The war has greatly stimulated the production of sugar in these countries, but the establishment of new sugar plantations, with the installing of the machinery necessary for preparing material for market, is not a rapid process; therefore extension of the production of cane sugar cannot rapidly meet the deficit.

The reasons at once appear, then, why we must cut down our use of sugar and send all of our surplus and savings to the Allies, who, besides the disruption of their beet sugar fields and the cutting off of a regular supply from the Central Powers and from Russia, are much farther from available markets than we.

THE MILK SITUATION

Because of the increased cost of everything that has to do with the production of milk, from the feed itself to the hired man who tends the cows, the price of milk has naturally had to advance. But this advance, while not nearly so great as that of many other foods, has made people cut down on the quantity of milk that they buy, with a very serious result to the dairy industry. Milk cannot be conserved. Less milk consumed means less milk produced. Farmers who are having to feed this most valuable food to the hogs this year are not raising so many heifer calves, and the result will be that two years hence there will be much less milk because there will be fewer cows to produce it.

This is a serious situation. Above all things, children need milk. Less milk means that the percentage of poorly developed and ill-nourished children in this country will be greatly increased. Practically all the dairy herds of neutral as well as belligerent countries abroad, have been killed off because of the lack of feed. This means that after the war there will be a great demand for stock and dairy products, which, if our production is less than at present, will help to make the situation then even more serious.

One way in which this serious outlook for the future can be counteracted is by using more milk. Milk is one of the cheapest and best foods, and with its products, butter and cheese, should be used abundantly by adults, while both milk and butter should form a principal part of the diet of every child.

CONCLUSIONS

The outstanding needs of the world in food are wheat, meat, fats, sugar, with a necessity for increasing our milk production. Our part in meeting these needs calls for increased production, elimination of waste, substitution of foods, and cutting down on our rations to a point of efficiency. The war tactics for the great citizen army are as clear as those of the army of fighters have been.

Bulletins containing recipes tested in the laboratories of the Department of Home Economics of the New York State College of Agriculture may be had without charge on application to the College.

SELECTING BALANCED MEALS

In order to obtain the proper amount of the various substances that the body needs to keep it healthy, every meal must provide a certain proportion of fuel, building foods, and body-regulating foods. A meal that furnishes the necessary quantities of each of these foods is called a balanced meal. The following are suggestions for selecting balanced meals, by Flora Rose, Professor of Home Economics, New York State College of Agriculture:

I. You need three things from your daily meals:

1. You need fuel. Your body must be kept warm, and it must have energy for its work. The more work your body does, the more fuel you must feed it. If you do not eat enough fuel food to keep your body warm and to do its work, your body will burn some of its own tissues as fuel and you will grow thin. If you eat too much fuel food, you may grow fat or you may clog the machinery of your body and injure it.
2. You need building material. You must supply all parts of your body, muscles, bones, nerves, blood, and the rest, with the materials that they must have if they are to grow or to be kept in repair. If day after day you fail to eat enough of any material needed by the body for growth or repair, your body will become worn out and damaged.
3. You need body-regulating substances. Your body works well only when your daily food contains various materials that keep the machinery of your body running smoothly. Without these regulators your body could not burn its fuel nor-

mally. It could not set its building materials in place. It could not throw off its wastes. It would cease to grow. Friction would occur. The machinery of your body would be damaged, and the engine would stop.

II. Each food that you include in your meals should be there for one of the three following reasons:
1. Because it is a good fuel food, and you need the energy its fuel can give.
2. Because it contains building material that your body needs.
3. Because it can supply some body-regulating substance that you must have to make the machinery of your body run smoothly.

III. You need to know three things about the food that you eat:
1. Which substances in food give them their fuel value, and which foods are best for you to select as fuel foods.
2. Which substances are needed to build your tissues, and which foods are best to select for each building material.
3. Which foods will give you the body-regulating substances that you need in a form that you can use to best advantage.

GROUP I. FUEL FOODS

1. Most of your day's energy should be supplied by foods rich in starch, such as breakfast foods, oatmeal, cornmeal, barley, wheat foods; bread of various kinds; dried peas, beans, and lentils; vegetables rich in starch, such as potatoes.
2. Some of your day's energy should be supplied by foods rich in fat, such as milk, cream, butter, eggs, fat meat, bacon; meat fats of various kinds; oils or foods rich in oil.
3. Your day's meals are more palatable if some of your energy is supplied by foods rich in sugar. Sugar is not necessary, and too much should be avoided. Examples of such food are sweet fruits and vegetables; honey; molasses; sirups; sugar; desserts and candy.

GROUP II. BUILDING FOODS

Four conspicuous building materials that you must consider in selecting your food are protein, lime, iron, and phosphorus. You need some of each, every day.

1. Protein:
   a. Some of your day's protein should be supplied by one of the following animal foods: milk; eggs; cheese; meat. One of these foods will replace another.

b. Most of the remainder may be supplied by these foods: breakfast foods, oatmeal, wheat, cornmeal, barley, rye, buckwheat, and the like; breads of various kinds; dried peas, beans, and lentils; nuts.

2. Lime: Lime is necessary. Many dietaries are low in lime.
   a. The most valuable lime foods are milk, cheese, eggs. Milk contains more lime than a saturated lime solution. It is the cheapest lime food.
   b. Next in lime value are leaves and stems of plants, such as spinach, celery, lettuce, cabbage, onions, swiss chard.
3. Iron: Many dietaries are low in iron. Foods best to supply you with iron are green vegetables, the most valuable source; fruits and vegetables as a whole; breakfast foods and breads made from the whole grain, the cheapest source; eggs, excellent but expensive; meat, rich in iron but the value of its iron is questioned.
4. Phosphorus: Foods best to supply your phosphorus are milk; eggs; meat; breakfast foods and breads made from the whole grain; dried peas, beans, and lentils.

GROUP III. BODY-REGULATING FOODS

You must select regulating foods from each of these groups:

1. Laxative foods: fruits and vegetables; breakfast foods and breads made from the whole grain.
2. Foods containing salts, acids, or flavors needed by you; fruits and vegetables.
3. Foods containing two unknown factors both of which you must have if you wish to grow or to retain your health.
   a. The first unknown factor essential for growth and health is found in amounts sufficient to your needs in milk; butter; cream; eggs; meat, if you eat enough of it; cod-liver oil. The following foods contain it in amounts that will help, but they are too bulky to enable you to eat enough for your needs: leaves and stems of plants, such as spinach, swiss chard, dandelion greens, cabbage, onions, celery.
   b. The second unknown factor essential for growth and health is found in amounts sufficient for your needs in milk and eggs; breakfast foods and breads made from the whole cereal grain; peas, beans, and lentils.

The following book is suggested for reference: Feeding the Family, by Mary Swartz Rose.

SCHOOL LUNCH MENUS

These menus are suggestions to the teacher who wishes to prepare one hot dish during the noon hour for the children. The main dish, mentioned first, is to be prepared at the school, while the sandwiches and the dessert should be brought by the children from their homes. Each of the menus will provide a properly balanced meal for a school child.

Cream potato soup
Jelly sandwiches
Pears

Macaroni and cheese
Lettuce or relish sandwiches
Canned fruit

Cocoa
Fig and nut sandwiches
Apples

Rice cooked in fireless cooker, served with brown or maple sugar and whole milk
Apples
Ginger cookies

Baked potatoes
Milk
Apple sauce, gingerbread

Toasted cheese sandwiches
Cocoa
Figs, dates, raisins, dried cherries

Cereal coffee served with hot milk
Peanut-butter sandwiches
Baked apples

Vegetable salad
Date or raisin sandwiches
Custard

Creamed eggs and cold slaw
Bread and butter sandwiches
Raisin cookies

Vegetable milk chowder
Crackers
Stewed prunes or apples

Cream tomato soup
Cottage cheese and nut sandwiches
Chocolate cornstarch pudding

NOON HOUR AT A RURAL SCHOOL IN TOMPKINS COUNTY

These boys and girls are having hot soup made of spinach and milk as part of their lunch

GOOD STAND-BYS FOR CHILDREN

Children need more fuel food in proportion to their size than do grown persons, for they are more active than adults. However, the digestive system of a child is not fully developed, and for this reason he should not eat some of the hearty foods that grown men and women who are exercising outdoors all day may need. For example, fried foods and fat meats are not good for children although they may be just the food to satisfy the outdoor adult worker.

Some suggestions for wholesome food for children are as follows:

MAIN COURSE

Cream soups
Chicken
Fish
A little well-cooked meat
Eggs
- Soft cooked
- Poached
- Scrambled
- Omelets

VEGETABLES

Baked potatoes, both white and sweet
Green peas
Beans
Spinach
Asparagus
Beets
Carefully cooked cabbage
Onions
Lettuce
Celery
Carrots

CEREAL FOODS

Cornmeal mush
Oatmeal porridge
Toasted bread
Toasted muffins
Milk toast

FRUITS

Fresh fruits
Baked and stewed fruits
Dates
Figs

BEVERAGES

Milk
Cocoa

DESSERTS

Rice pudding
Tapioca pudding
Indian pudding
Custards
Bread pudding
Junkets
Fruit whips
Fruit jellies
Brown betty

CAKES AND CANDIES

Sponge cake
Plain cookies
Molasses candy
Fruit squares
Fruit pastes
Popcorn balls

MILK AND MILK DISHES

MILK is not only the best food in the world for children, it is also the most necessary. Children must have milk; without it they cannot grow strong and healthy. Every boy and girl should drink at least a quart of milk a day, one glassful at every meal, one between meals, and some cooked in soups, cocoa, puddings, or other dishes, for cooked milk is just as good for children and adults as raw milk.

Milk is valuable to children because it contains a great deal of lime, which makes their bones and their teeth strong and firm. It also builds the various tissues of their bodies. It contains substances that make them grow. One of these substances is found in the fat of milk, and for this reason it is better to use whole milk than skimmed milk. Adults do not need so much of these growth-promoting substances as children do; therefore skimmed milk may be used by them as a part of their food. Skimmed milk contains the valuable lime and other building material. Because of these growth-promoting substances, butter-fat is a valuable form of fat for children. For this reason children should be given butter with their meals in preference to butter substitutes. In addition to building their bodies and making them grow, milk gives children energy, which makes them work, study, and play.

Dr. E. V. McCollum, an expert in nutrition, has experimented with rats to find out the results of feeding them milk and other foods. He has taken baby rats of the same breed and fed them differently and watched the results. He has found that seeds, such as wheat, corn, peas, beans, rice, and oats, fed to the rats without any other kind of food, will not make them grow. Even when fed meat with these seeds, the rats will not grow; but when milk is fed with the seeds, the rats grow large and are healthy. When they are fed a mixture of other foods but no milk nor butter, they develop sore eyes and often die. When butter is fed to the young rats that have developed sore eyes, they become healthy again and grow to normal size.

It is probable that foods that will not make rats grow or that give them sore eyes, may have the same effect on children. Children have been found to develop sore eyes, to have been stunted in growth, and to have been ill in other ways because they have not had enough good milk and butter to eat.

CREAM VEGETABLE SOUPS

1 cup thick white sauce
½ cup vegetable pulp
1 to 2 cups of water in which vegetables were cooked
Salt
Pepper
Finely minced onion
Celery salt

The vegetables are cooked in boiling salted water until tender, rubbed through a strainer, and in most cases used with part or all the water in which they were cooked.

Left-over bits of vegetables, meats, fish, or chicken can be used for cream soups by being ground and heated with a little liquid before being strained and added to the white sauce.

CREAM TOMATO SOUP

2 cups canned tomato
½ cup water
1 bay leaf
1 slice onion
Celery salt
⅛ to ¼ teaspoon soda
2 cups medium thick white sauce

Simmer the tomato with the seasonings for about one-half hour. Strain the mixture, and add the soda. The amount of soda required depends on the acidity of the tomato. Just before the soup is to be served add the hot tomato juice to the white sauce gradually, stirring it well. Serve the soup immediately.

PEACH BAVARIAN CREAM

2 tablespoons gelatin
1 cup whey
⅔ cup sugar
1 cup peaches cut in small pieces
1 tablespoon lemon juice
1 cup sour cream, whipped

Soak the gelatin in the whey, and dissolve it by setting the dish in a pan of boiling water. Add the sugar, the fruit, and the lemon juice. Chill the mixture. When it begins to thicken, fold in the whipped cream, and turn it into a mold. Serve the pudding with a soft custard.

JUNKET

3 cups whole milk
½ cup sugar
1 junket tablet
1 tablespoon cold water
1 teaspoon vanilla

Heat the milk and the sugar over hot water, stirring the mixture constantly until it is just warm. Crush the junket tablet, and dissolve it in the cold water. Add this with the vanilla to the milk, and stir the mixture quickly to mix it thoroughly. Pour it into sherbet cups or dishes in which it is to be served. Let it stand in a warm place until it is firm; then chill it. This junket may be served plain, or with top milk or cream.

FIRELESS COOKERS

A homemade fireless cooker might easily be an instructive and interesting piece of equipment of each school where lunches are served. Some of the older boys of the school might construct such a cooker, and many of the noonday meals could be prepared in it, the cooking going on while the school is in session. The fireless cooker is convenient for keeping food warm when it has been prepared ahead of time. Here are two inexpensive ways for making fireless cookers, and recipes for making a few simple cereal dishes in them.

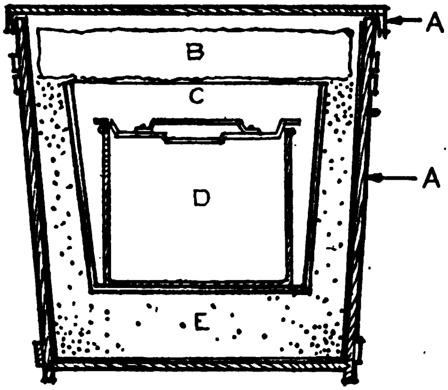


DIAGRAM OF A HOMEMADE FIRELESS COOKER

A, outer case; B, cushion; C, cooking compartment; D, food container; E, packing material

A DURABLE COOKER

Materials.— Butter tub, candy bucket, wooden box, trunk, galvanized iron ash can, or any other similar receptacle that has a cover that can be fitted with strong hinges and fastenings. Sheet asbestos one-eighth inch thick. Ground cork. A deep bucket or kettle of agate, galvanized iron, or tin with a tight-fitting flat cover, small enough to allow at least three inches of space between the case and the top, the bottom, and the sides of the bucket. A kettle or bucket of agate or aluminum with a tight-fitting cover that can be clamped down. This must be small enough to fit in the first metal bucket. A seamless aluminum kettle is most commonly used. Special fireless cooker utensils can generally be obtained from a local hardware dealer or a firm that manufactures fireless cookers. Heavy muslin, drilling, or denim for a cushion. Heavy wrapping paper, cardboard, shellac.

Directions.— Line the tub or the box and its cover with the wrapping paper, allowing the paper to extend three or four inches above the receptacle. Cover the outside of the larger bucket or kettle with the asbestos. Pack the bottom of the case tightly with ground cork three or four inches deep. Set the kettle on this, and pack the space between the kettle and the sides of the case with cork. Cut cardboard to fit over the space between the tub and the bucket, and paste wrapping paper over this cardboard. Turn the wrapping paper that extends over the top of the tub down to the height of the tub, tack it to the tub or box, and shellac it.

Make a cushion to fill the space at the top of the cooker as follows: Cut two pieces of muslin the size of the cover of the tub, join the sides with a three-inch wide strip of the material, and fill this with cork.

Put the tightly covered food receptacle containing the boiling food into the bucket, adjust the cover of the bucket, place the cushion on top, and close the cooker.

A LESS EXPENSIVE COOKER

Materials.— Box or candy bucket; size 15 by 15 by 15 inches is large enough for a one-gallon food container, but it may be larger. Granite bucket of one-gallon capacity or larger if desired. Sheet asbestos large enough to cover the sides and bottom of the bucket; cardboard may be used if asbestos cannot be obtained. Excelsior, hay, or straw for packing.

Directions.— Line the box or the bucket with several layers of paper to make it air-tight. Put a layer of packing material about three inches deep in the bottom of the box. Press it down well. Cover the sides and the bottom of the one-gallon bucket with asbestos.

The strip of asbestos for the sides should be cut as wide as the depth of the bucket and as long as the circumference of the bucket. The piece for the bottom should be cut just the size of the bottom of the bucket. The asbestos should then be sewed or glued in such a way as to make a case into which the bucket will fit loosely enough to be put in and taken out when necessary.

Slip the bucket into the asbestos case, and put it in the center of the box that has been prepared for it. Pack the space between the bucket and the box very firmly up to the top of the bucket. Cover the packing with cardboard or layers of paper cut to fit the space. Make a pad or a cushion to fit into the space between the top of the bucket and the top of the box. This space should be at least three inches deep. The cushion may be filled with the packing material. Place hinges and fasteners on the top of the box to hold the cushion down closely. The hinges and catch may be made of strips of leather or cloth.

Place the mixture to be cooked in the container of the cooker. Bring it to the boiling point, and allow it to continue to boil for a few minutes. Put the bucket into the box without removing the cover if possible, in order to hold the steam and heat. The cushion should fill the top of the box completely, so that there will be no air space when the top is closed. Food should be left in the cooker at least four hours, and in some cases overnight.

TURKISH PILAU

½ cup rice	1 tablespoon butter
2 tablespoons green pepper or onion, chopped	1 teaspoon sugar
	1¾ cups stock or water
1 cup tomatoes	1 teaspoon salt

Wash the rice. If the pepper is used, discard the seeds. If fresh

tomatoes are used, remove the skins, and cut the tomatoes in pieces before measuring them. Place all the ingredients together in the food container, bring the mixture to the boiling point, and transfer the kettle to the fireless cooker. Allow it to remain in the cooker for 2 hours. Stir the pilau lightly with a fork before serving it.

HOMINY GRITS

1 cup hominy grits
5 cups water
2 teaspoons salt

Pick over and wash the hominy grits. To the salted boiling water add the hominy slowly so as not to stop the boiling. Continue to boil the mixture rapidly for 10 minutes over the fire; then put the vessel into the cooker as quickly as possible and allow it to remain overnight, or for about 12 hours. The vessel of hominy may be placed in another vessel of boiling water before being placed in the cooker.

SAMP (COARSE HOMINY)

½ cup samp
1½ teaspoons salt
Water

Soak the samp in 1 cup of cold water for 6 hours. Add the salt and 3 cups of boiling water. Boil the mixture rapidly for 45 minutes; then cook in the fireless cooker for 8 to 10 hours.

OATMEAL

1 cup oatmeal
1 teaspoon salt
3 cups water

Carefully look over the oatmeal and remove any husks or foreign substances. Add the oatmeal gradually to the boiling salted water, and boil it rapidly for 10 minutes, stirring it constantly. Put it into the fireless cooker. After 2 or 3 hours it will be soft, but a better flavor will be developed by longer cooking.

BOILED RICE

1 cup rice
3½ cups water
1½ teaspoons salt

Look over and wash the rice thoroughly through several waters, until cloudiness is removed. Add the rice gradually to the boiling salted water and boil it for 5 minutes before putting it into the cooker for 45 minutes or an hour. The rice may be cooked overnight in the cooker.

SEWING

The following simple problems offer interesting work for girls and, in some cases, for boys. For explanation of the different stitches and operations mentioned in these directions, reference should be made to the introductory article on hand sewing published in the leaflet for September, 1917.

MACHINE-MADE KIMONO APRON

NANCY H. MCNEAL

Home Economics Specialist in Junior Extension Work

Girls registered for the junior home project in clothing in New York State are using the following suggestions and directions for making a

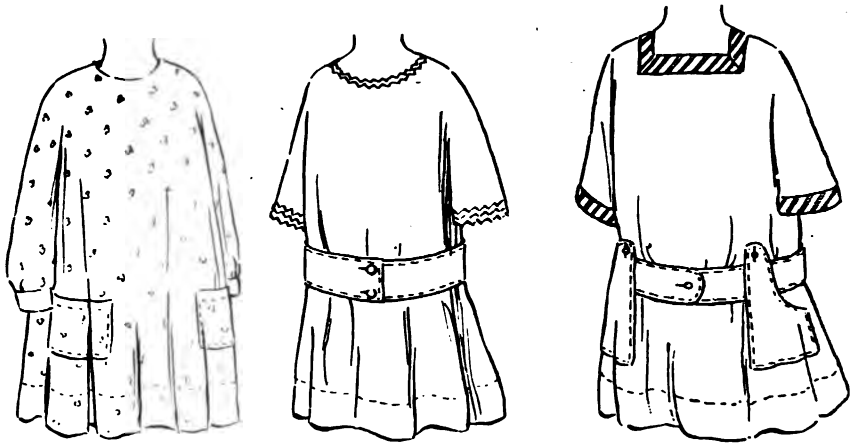


FIG. 1. DESIGNS FOR A KIMONO APRON

kimono apron or a simple dress. Many other girls may find this apron a desirable garment. It is so simple in construction as to practically insure success.

Pattern.— Any good commercial pattern may be used. All pattern manufacturers show designs similar to those in figure 1, from which choice may be made.

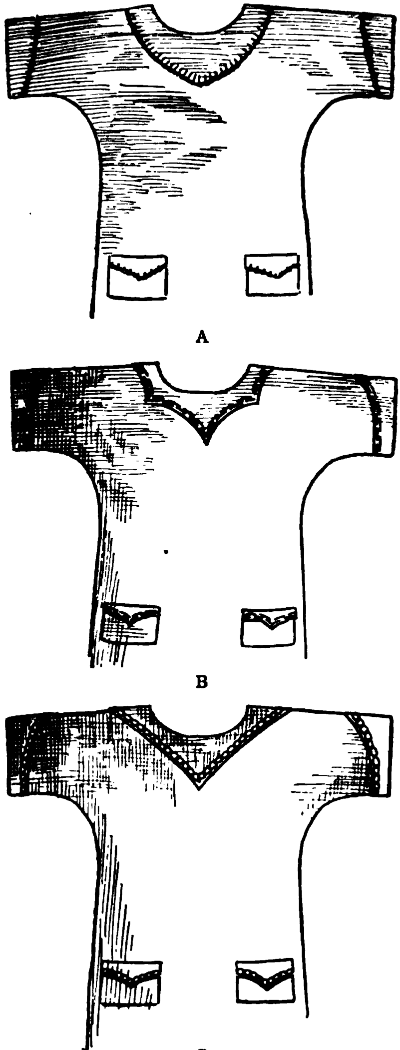
Material.— In order to make the best possible selection of material for this garment and to gain some knowledge of suitable material for such uses in general, the girls should make a collection of samples from all possible sources. They may then compare and discuss intelligently the advantages of one material over another for durability, laundering qualities, design, and color. Gingham and percale are perhaps the best materials for this apron. The material should be of modest color, and

FIG. 2. KIMONO APRON OF BLUE AND WHITE CHECKED GINGHAM TRIMMED WITH PLAIN BLUE, A PLEASING COMBINATION OF MATERIALS

any design, such as check, plaid, stripes, or figure, should be inconspicuous. A particularly pleasing combination of materials is shown in figure 2.

The amount of material needed for the plain apron is about twice the length from the top of the shoulder of the person to the bottom of the dress, plus twice the hem allowance. This amount does not allow for a

belt. One-half yard of contrasting material is required if a yoke and sleeve facings are used as shown in figure 2.



· FIG. 3. DECORATIVE STITCHES SUITABLE FOR THE YOKE AND SLEEVE FACINGS OF A KIMONO APRON

A. Blanket stitch; B, darning stitch; C, chain-stitch

Trimming.— If a combination of figured and plain material is used (fig. 2), no other trimming is needed. If the apron is made entirely of one material, a narrow finishing braid may be used for decoration on sleeves, neck edge, and pockets. In case some handwork is desired, decorative stitches may be used on the edges of neck, sleeves, and pocket facings (fig. 3).

Cutting the apron.— If a chart for placing the pattern on the cloth accompanies the pattern, it should be followed. Suggestions for placing the pattern are given in figure 4. The cloth should be doubled for cutting.

Take the length from the top of the shoulder of the person to the bottom of the dress. Measure this length on the pattern from the top of the shoulder, and make necessary alterations in the length of the pattern. Allow at least three inches for the hem at the bottom, both back and front.

This apron does not require a placket; none need be cut even if the pattern suggests it.

After the apron is cut, it should be tried on to see whether the neck opening is large enough to slip over the head easily. If it is not, it should be cut larger. Care should be used, however, not to cut it larger than necessary and thus make the neck too low.

If a yoke and sleeve facings, are desired and are not included in the commercial pattern, special patterns may be made as follows (fig. 5):

Cut a piece of paper about fourteen inches square. Fold it in half: On the folded edge of the paper, cut the neck opening the same size as in the cloth, using the cloth as a pattern. Cut the outer edge of the paper pattern any desired shape. Cut the yoke in cloth from this prepared pattern.

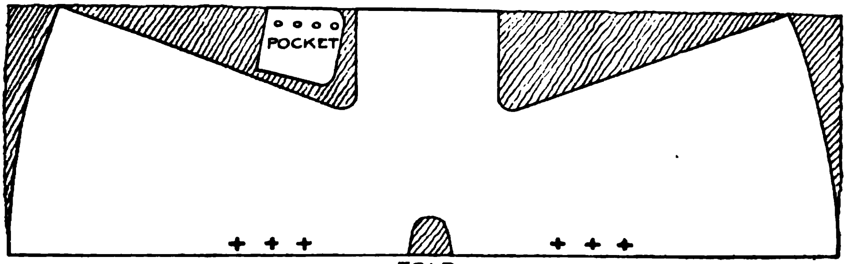


FIG. 4. CHART FOR CUTTING A KIMONO APRON
Fold the cloth lengthwise and place the pattern as shown here

Making the apron.— Pin the yoke facing to the wrong side of the apron with the neck edges even, and baste it. After trying on the apron to be sure that the neck size is right, stitch a seam around the neck. Slash the seam almost to the stitching, being careful not to cut the stitching (fig. 6).

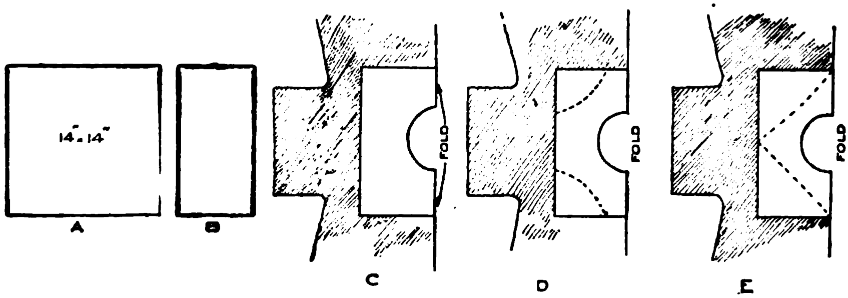


FIG. 5. METHOD OF CUTTING A PATTERN FOR A YOKE FACING FOR A KIMONO APRON
A, square of paper; B, square of paper folded in half; C, paper applied to the apron and neck opening cut out; D and E, designs for yoke marked on the paper pattern

Turn the facing through the neck opening on the right side. Crease a one-fourth inch turn to the wrong side around the edge of the yoke. Baste the yoke to the apron, and stitch it near the edge to hold it in place. Apply the sleeve facings in the same way as the yoke (fig. 7).

Pin and baste the underarm and sleeve edges for french seams. A french seam is made by first sewing a plain seam on the right side of the garment, trimming this seam to about one-eighth inch, turning it to bring the two right sides of the cloth together, creasing it well, basting it near

the edge, and stitching it on the wrong side just far enough from the edge to completely enclose the first seam.

Match the edges at the bottom of the sleeve carefully, and retrace the stitching at this point to make it very strong. To do this, start about one inch from the end of the sleeve, stitch to the end, turn around and stitch back over the same line and on down the seam. The edges of the seam may not come out even at the bottom of the apron. If they do not, trim them even.

FIG. 6. METHOD OF SLASHING THE NECK SEAM OF A KIMONO APRON

Make a one-fourth-inch turn to the wrong side around the bottom, make another turn the width allowed for the hem, using a cardboard gauge. Lay the fullness at the top of the hem in small pleats. Baste it in place, and stitch it near the edge.

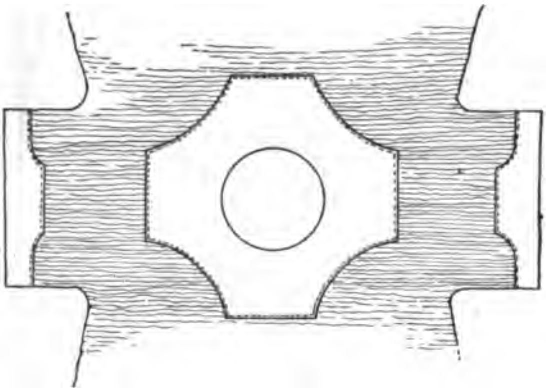


FIG. 7. NECK AND SLEEVE FACINGS APPLIED TO THE APRON

This should be done before the underarm seams are made

If pockets are used, they must be made and put on the apron before the underarm seams are sewed. The pattern shows the place for them.

Narrow straps may be used at the underarm seams to hold the belt in place. The belt may be fastened with clasps or with hook and eye, or it may have button and buttonhole.

HANDMADE COMBINATION APRON

NANCY H. MCNEAL

Home Economics Specialist in Junior Extension Work

A combination apron, a favorite type, is shown in the accompanying illustration. Directions for making it are as follows:

1. Cut a piece of cloth about thirty inches long and twenty inches wide. The size should depend somewhat on the size of the person who is to wear the apron. Draw threads as a guide for cutting.

2. Allow eight inches on one end of this cloth for the row of pockets across the bottom. If there is no right nor wrong side to the cloth, the part for the pockets may simply be turned up on the right side of the

apron. If there is a right and a wrong side, cut off eight inches across the narrow end and sew it on with a french seam to make the right side of the cloth come on the outside of the pockets.

3. Make a hem about one-half inch wide across the top of the pocket section on the wrong side.

4. Pin this section in place.

5. Turn in the outer edges of the pocket section and the apron, and baste them together. Overhand these edges together.

COMBINATION APRON

This apron gets its name from the fact that it serves both as an apron and as a bag for sewing and mending

6. Make a hem about one-fourth inch wide on the two sides of the apron above the pocket section.

7. Divide this pocket section into three equal parts, or make the center one a little wider than the other two. Run a line of stitches from the top to the bottom of the pocket section at the two division points. If the material is figured and the stitches will not be noticeable, plain running stitches may be used. If the material is plain, a decorative stitch, such as chainstitch, may be run on these lines and on the lower edge of the band.

8. Gather the top edge of the apron, and put it on a band.

MACHINE-MADE CHEMISE, OR PRINCESS SLIP

NANCY H. MCNEAL
Home Economics Specialist in Junior Extension Work

The chemise is a simple garment that takes the place of both an underwaist, or corset cover, and a petticoat. The style called envelop chemise is designed to take the place of an underwaist and drawers. Princess slip is simply another name for chemise.

CHEMISE MADE OF UNBLEACHED MUSLIN

The neck and the armholes are finished with narrow braid. The bottom is finished with a plain hem

This garment requires no buttonholes, buttons, band, nor placket. Besides being simple in construction, it is comfortable and graceful and adapted to present-day models of girls' and women's outer garments.

Pattern.—The pattern for a chemise, or princess slip, may be selected from any available fashion book. Suggestions for a good model may be found in the illustrations. The size of the pattern should be determined by the age of the girl.

Materials. — Longcloth, berkeley cambric, nainsook, and muslin are the most desirable materials for a chemise. A firm material is more easily handled and if of good quality will be more durable than one of lighter weight. For this reason unbleached muslin is good.

The amount of material needed is stated on the envelop containing the pattern, or it may be reckoned as follows: the length from the top of the shoulder of the person to the bottom of the dress, plus the amount desired for a hem and for letting down, multiplied by two.

Trimming.— The chemise may be made with no trimming at all. There is often greater beauty in a plain, well-made garment than in an elaborately trimmed one. A very simple but attractive trimming may consist of a line of chainstitching or featherstitching in white at the edges of facings or hems, top and bottom. Narrow lace or embroidery edging is also suitable. Lace should be of a kind that will wear well; torchon,

tatting, or crochet is suitable for the heavier materials, and round-mesh valenciennes for the finer materials. Embroidery made on material that matches the material of the garment as nearly as possible should be used. It should have a firm, well-made edge and should be simple in design. Elaborate and showy decoration is not in good taste on undergarments. The amount of trimming needed may be determined from the suggestion on the pattern envelop or by measuring rather loosely around the neck, the armholes, and the bottom, and allowing about six inches additional for seams.

To cut the chemise, or slip.—Always read carefully the directions on the pattern envelop. Place the pattern on the cloth in the same way as for the kimono apron or according to the chart on the pattern envelop. Pin the pattern in place. Cut smooth edges.

CHEMISE MADE OF BERKELEY CAMBRIC

The neck and the armholes are finished with torchon lace. The bottom is finished with a flounce of embroidery

To make the chemise, or slip.—Pin the underarm and shoulder edges of front and back together with notches matching. Place the pins perpendicular to the edge of the cloth, and about an inch from the edge. Pins placed in this manner will cause no fullness in the edge and will not be in the way of the machine stitching. No basting should be necessary if you watch the edges carefully and hold them together well as you stitch. Make french seams. Try on the slip. Note the size of the armholes and the neck. The only alteration likely to be necessary is in the size of the neck. It may or may not need gathering. If gathers are not necessary, the edge may be finished with a very narrow hem, a facing, or a binding. Lace may then be overhanded or stitched on the edge of this hem, facing, or binding.

If there is extra fullness, it may be taken care of in one of two ways: (1) Finish the neck edge with a binding or a facing as already suggested, but make it wide enough to use as a casing for a drawstring. (2) Gather

the edges for a few inches each side of the center front and if necessary each side of the center back. Then bind or face this edge. This will hold the gathers in place. Embroidery may be used as a facing.

The bottom of the slip may be finished with a plain wide hem, or with a narrow hem with lace overhanded to the edge, or with a facing or flounce of embroidery.

Finishing edges with embroidery.— Embroidery may be applied as a facing in the following way. Allow the design edge to extend beyond the edge of the cloth. Cut away the material from three-eighths to five-eighths inch from the design. Baste the embroidery to the cloth with the right sides together and the raw edge of the embroidery extending one-fourth inch beyond the edge of the cloth. Make the joining at the center front of the neck and at the underarm seams. Stitch from one-eighth to one-fourth inch from the design of the embroidery. If the embroidery side is uppermost on the machine, the presser foot may act as a gauge. Trim the seams if necessary. Turn in the raw edge of the embroidery about one-eighth inch. Crease it, baste it down, and stitch along the edge.

MIDDY BLOUSE

NANCY H. MCNEAL

Home Economics Specialist in Junior Extension Work

The middy blouse is a most satisfactory garment for girls, especially for school wear. In appearance, it is becoming and attractive. Since it allows freedom of movement and permits the use of strong, durable material, it is a suitable garment for wear during many kinds of physical exercise.

Pattern.— A very simple model successfully made will be much more satisfactory than an elaborate one not so well made; therefore the selection of a pattern should receive very careful attention. If you have done a great deal of sewing, you may safely undertake pleats or smocking perhaps; otherwise do not risk it.

If smocking is to be used, a pattern having a yoke and allowing extra fullness in both front and back should be chosen. The fancy stitches are then put into the gathers below the yoke edges and above the cuffs. No directions for smocking are given here, since few girls will choose to undertake it, but an interested worker can probably find some one to teach her the stitches.

Materials.— Indianhead, duck, poplin, percale, unbleached muslin, and galatea are some of the most desirable materials for a middy blouse. A softer material, such as linen, cotton crepe, or gingham, is suitable for smocking. Buy the amount of material called for on the pattern envelop.

Colors.—An all-white middy is perhaps best; however colored collars and cuffs are often satisfactory. Any colored material should be tested for laundering, since it is difficult to find even reds or blues that will not run into the white. A red or a blue lace or tie is attractive with a white middy.

Shrinkage.—A middy is not intended to fit closely. Therefore it is not necessary to shrink the material. It should be made sufficiently loose in the beginning to allow for shrinkage.

To cut the middy blouse.—Read carefully the directions on the pattern envelop. Consult the chart, if there is one, for placing the pattern on the cloth. Place large pieces first, but place all pieces before beginning to cut the material. If possible ask some experienced person to look over your work at this point.

To make the middy blouse.—Since the middy blouse is difficult to make fairly complete directions are given.

1. Front facing. If you need to use a facing in which to work eyelets on the front of the middy, follow the directions on the pattern very closely. This facing should be stitched in place before the underarm seams are made.

2. Basting. Match the notches, and baste the shoulder

A PLAIN BUT ATTRACTIVE MIDDY BLOUSE
It is made of poplin and is all white except for a scarlet lace

and underarm seams about one-half inch from the edge on the right side.

3. Fitting. Try on the blouse and make alterations in the seams if necessary. Alterations are not likely to be necessary, however.

4. Shoulder seams. Finish the shoulder seams with a flat fell turned toward the front.

To make a flat fell, stitch the seam one-half inch wide or a little wider, trim the front edge of the seam to about one-eighth inch, crease a narrow turn on the back edge, and crease the seam flat. Baste the seam, and stitch it very near the edge. Remove the underarm basting, and leave this seam open until the collar is attached.

5. Collar. The collar that goes with the type of front facing described is easily adjusted if the directions on the pattern are followed exactly. If no facing is used, cut the neck low enough to slip over the head without a placket, and make a sailor collar to come to the point in front.

To make a sailor collar, cut one layer of cloth by the pattern, baste or pin this piece to another layer of cloth, and cut a second layer by it. Stitch a seam around the outside edges, remove bastings or pins, turn the collar inside out, and crease the seam edge carefully. Pin the collar in several places to hold the two layers together and exactly even, especially at the neck edge.

6. Joining the collar to the blouse. Pin the center back of the collar to the right side of the blouse. Fit the collar to the neck edge, and pin it in place, keeping the two layers of the collar together. Baste it with short, firm stitches. To finish this seam, use a bias strip of cloth or a bias tape sufficiently long to reach around the neck edge. Baste this strip to the neck edge on the top of the collar. Stitch a seam as narrow as possible to catch all the layers of cloth firmly. Trim the seam if necessary. Make a narrow turn on the inside edge of the strip. Crease the seam so that the strip lies flat on the inside of the neck edge. Baste it in position. Finish the ends at the point in front neatly with hand stitches. Stitch the strip very near the edge.

7. Finishing the sleeves at the bottom. A plain facing may be put on the right side of a short sleeve as follows: Cut a strip of cloth two and one-half to three inches wide and long enough to fit the bottom of the sleeve. Pin it flat to the wrong side of the sleeve with the edges even. Make a plain seam at the bottom. Turn the facing to the right side, crease it well, and pin it in place. Stitch it very near the upper edge.

A straight cuff may be used on either a long or a short sleeve. The lower edge of a short sleeve may be left plain, but the lower edge of a long sleeve must be gathered or pleated to hand size, before the cuff is put on. To make this cuff, cut a straight strip lengthwise or crosswise of the cloth from five to seven inches wide and long enough to extend around the lower edge of the short sleeve or to slip over the hand easily for a long sleeve. Pin the cuff to the lower edge of the sleeve, holding the right side of the cuff to the wrong side of the sleeve. If there is fullness in the sleeve, a gathering thread may be used to draw up the edge to the cuff size or the fullness may be laid in several small pleats. Stitch a seam about one-fourth inch wide.

The sleeve may be finished with a hem. For a long sleeve, the pleats may be put in after the hem to form a cuff effect. Explanations will be found on the pattern envelop.

8. Setting in the sleeves. Match the notches, and baste the sleeve to the blouse with the wrong sides together. Make a flat fell on the right side according to the directions given for the shoulder seam. Turn the seam toward the sleeve. Cut the sleeve edge to make it narrower than the waist edge, crease the waist edge to cover it, and stitch it to the sleeve.

9. Making the underarm and sleeve seams. Use a french seam or a flat fell turned toward the front for the underarm and sleeve seams. Match the edges exactly at the bottom of the cuff.

10. Hemming the blouse. At the bottom of the blouse make a hem of the width allowed in the pattern.

11. Pockets. Crease, baste, and stitch a hem at the top of the pockets. Turn under the remaining edges, and baste them. Place the pockets on the blouse according to markings on the pattern, and baste them in place. Stitch them near the edge.

12. Eyelets. Eyelets are very easily made and are satisfactory for the front closing. Measure the spaces carefully and punch three or four eyelets on each side of the front opening. Use a punch that will not cut the threads but will merely push them apart. Make holes large enough to carry the lace or the cord easily. Bring the needle through from the wrong side to the right side a few threads back from the edge of the hole, leaving an end of the thread about an inch long. Hold this end firmly until you have made several stitches. Take close overhanding stitches from right to left, drawing them tight to make a firm edge. Fasten the thread by taking two or three small stitches on the wrong side through just one layer of cloth.

SEWING BAG

JULIA GLEASON
Instructor in Home Economics

As a school sewing problem a simple bag has many possibilities. It may be made of new material or from scraps of various kinds. Ribbons, silks, cretonne, linen or cotton crash, chambray, poplin, monk's cloth, and similar materials are suitable. The bag is a problem in art as well as in sewing. Interesting designs and attractive color combinations may be worked out in many simple ways.

The sewing bag may be any size desired. A bag nine by seven inches is useful for holding small sewing equipment, such as scissors, thimble,

A B C

SEWING BAGS

This type of bag requires no fine, tedious stitches. Bag A is made of tan chambray, Bag B of natural-colored linen, Bag C of cotton crash

needles, and thread; a larger bag is useful for holding garments that are being made. Bags of this kind may also be used for holding handkerchiefs, stockings, knitting, or crocheting.

In the bags shown on this page a simple decorative stitch is used to secure the edges and form the design and the color scheme. Bag A is made of tan chambray, and the running and overcasting stitches are of heavy, dull green mercerized floss. Bag B is made of natural-colored linen and finished with the blanket stitch in brown mercerized floss. Bag C is of cotton crash, and the cross-stitch initials and the stitches that secure the edges are done with rose-colored mercerized floss. The cross-stitch over the edges is made by taking the overcasting stitch first in one direction and then in the opposite direction. The success of this type of bag depends on the careful spacing of the stitches and the selection

of the color scheme. Cords for these bags are made by twisting together four strands of the embroidery floss used for the stitches.

For one of these bags one piece of material twenty-seven inches by nine inches or two pieces fourteen inches by nine inches are required. In the latter case the seam at the bottom is finished like the sides. Such a bag is made as follows:

Make a one-fourth-inch turn to the wrong side on all edges. For heading and casing make a second turn two inches wide on the two ends, and baste these hems in place. To make the casing, run a line of basting three-fourths of an inch above the first basting. Place the ends of the strip together, or if two pieces are used, lay the two bottom edges together. Baste together the sides and if necessary the bottom, as far as the casing. Then baste each side separately beyond the casing to the top. Sew the edges together with a decorative stitch, leaving a three-fourths-inch opening for the casing cord. Heavy mercerized floss of a harmonizing color may be used for these stitches and for the cord. Sew the casing with the decorative stitch used on

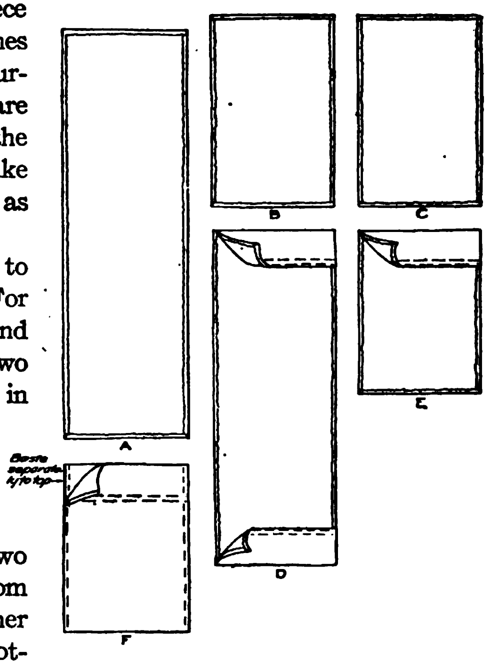
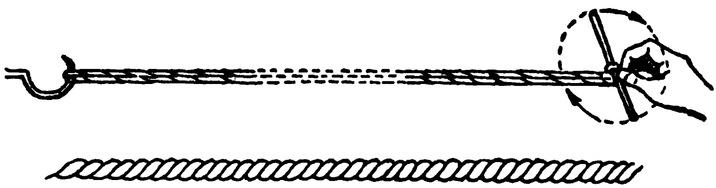


DIAGRAM SHOWING CONSTRUCTION OF A SEWING BAG

A, strip of material twenty-seven by nine inches with one-fourth-inch turn; B and C, strips fourteen by nine inches with one-fourth-inch turn, to be used when a longer strip is not available; D, long strip with ends turned for casing; E, short strip with end turned for casing; F, strip folded and basted ready for final decorative stitches



METHOD OF TWISTING STRANDS OF FLOSS TO MAKE CORDS

the edges. Initials may be made in cross-stitch, outline stitch, chainstitch, or couching, or they may be outlined and the background darned in.

The two cords require eight yards of floss, four yards for each cord. Twist two strands of the floss together tightly; double this cord, holding the center and the two ends securely at first; then release the center and allow the four-ply cord to twist. Finish each end with a knot and ravel out the fringe.

A

Bag A in the illustration on this page is ten by fifteen inches in size and is made of striped tan and cream-colored crash. The sides are sewed together in french seams. The simple straight line design is worked in greenish tan floss to harmonize with the stripe. The rectangular figure is in bright orange outlined in greenish tan. The thread loops to hold the cord are orange and the eight-ply cord is tan.

B

SEWING BAGS

Bag A is made of striped linen crash; Bag B is made of natural-colored linen crash

Bag B in the illustration on this page is ten by fifteen inches in size and is made of natural-colored linen crash. A plain seam with edges overcast is made on the sides and across the bottom. About twenty-four threads are drawn two inches from the bottom of the bag, and heavy brown cotton yarn is woven in to make the design. The two outside threads of brown run under five and over three threads of the crash. Then three threads of brown are run over the five and under the three threads of crash, alternating with the first group of brown threads. The center group of brown threads is put in like the first. The design may be varied by changing the number of threads run in and the number of threads in the groups. The top of the bag is finished with a hem one and one-half inches wide. The yarn is blanket-stitched over six small rings, which are sewed to the top of the bag. Braided cords with knotted ends are run through to draw up the bag.

BOOK BAG

BEULAH BLACKMORE
Assistant Professor in Home Economics

In making a bag for school books the first consideration should be the size and the number of books to be carried. Probably the largest book is the geography or the history book. The bags described here are designed to accommodate the large flat geography common in the schools.

Material.— Rather heavy, firm, closely woven material is best for a book bag. The material should be so closely woven as to protect the books from rain and heavy enough to keep its shape. Bags of canvas and cotton crash toweling are illustrated. Other usable materials are denim, tapestry, monk's cloth, gunny sacking, and grain sacking. The material should be neutral in color; a touch of brightness may be added in the decoration or the lining.

For a crash bag eleven inches deep, about thirty inches of material is necessary. If yard-wide material is used, with an inset to make the bag hold more, a half yard is necessary. Odd pieces of material may be used if joined by an inset and handles of a harmonizing color.

For the decorative stitches yarn, raffia, or heavy mercerized cotton is suitable.

To make Bag A.—1. Cut the face pieces. Measurements may be

A

B

BOOK BAGS

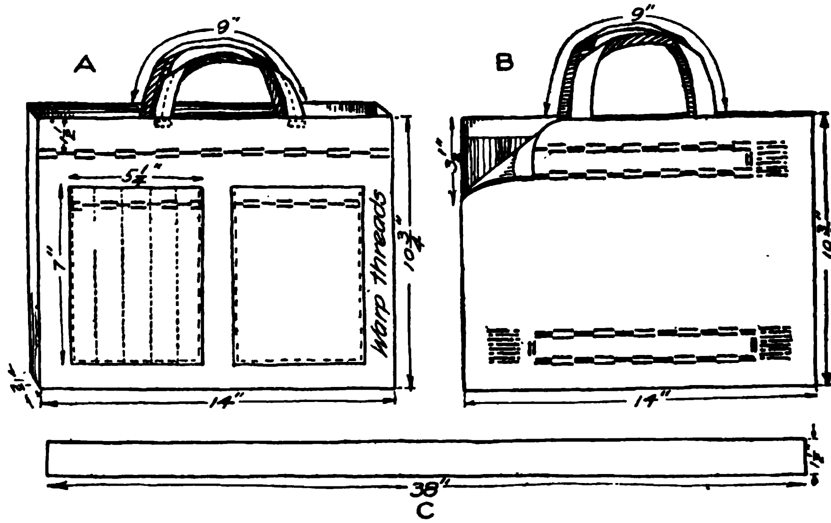
Bag A is made with an inset and will hold more than Bag B, which is flat. Tan burlap is used for Bag A, and cotton crash is used for Bag B

taken from the accompanying drawings if a bag of this size is desired. The measurements given are of a finished bag; therefore from three-eighths to five-eighths of an inch should be allowed on all edges for seams, depending on how easily the material frays. The warp threads should

run from the top to the bottom of the bag, for they are the stronger and can bear greater strain.

Decorative designs should be applied as soon as the faces of the bag are cut.

2. If pockets are desired, cut and decorate them. Baste and stitch



DIAGRAMS SHOWING CONSTRUCTION OF THE BOOK BAGS

A, bag with inset; B, flat bag; C, strip for inset in Bag A. The measurements in these diagrams are for the finished bags

the pockets into place on the front face of the bag. If one pocket is to be used for pencils and pens, stitch about three-fourths of an inch apart the desired number of lines through the pocket. If a sponge is used at school, the other pocket may be lined with oilcloth or rubberized linen. It is more convenient, however, to make a little pocket to slip into the pocket of the bag. It may then be taken out and cleansed.

3. Join the inset to the face pieces with a french seam. This french seam may be made to appear on the right side of the bag if a decorative finish, as on several of the sewing bags, is desired.

4. Make the straps for the handles, which should be long enough to slip over the arm easily. The simplest way to make the strap is to cut the material twice the desired width plus two seam allowances, fold this strip as shown in illustration, and stitch it through the center. A second way to make the handles is to cut the material as in the first method, fold the two edges together, stitch a seam on the wrong side, and turn the strap right side out.

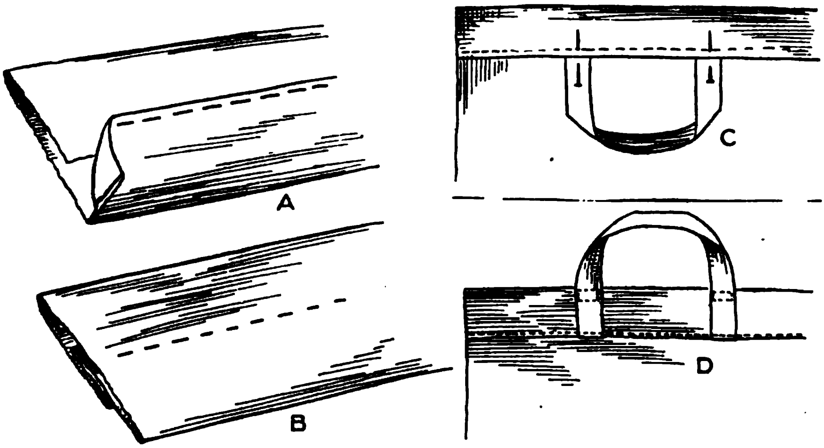
5. Crease and pin into place a hem around the entire top of the bag.

6. To fasten the handles to the bag very securely, insert them in the hem as shown in the illustration. Stitch the hem on the machine or secure it by a decorative stitch, catching in the handles.

7. Bring the handles up straight, and secure them to the top of the bag by a firm stitch. To keep the bag in shape at the top, a slender piece of wood, a long knitting needle, or a piece of featherbone may be inserted into the hem and made firm at the ends to keep it from protruding.

8. Press the bag carefully.

To make Bag B.— 1. Cut the two faces the desired size.



DIAGRAMS SHOWING METHOD OF MAKING STRAPS FOR HANDLES (A AND B) AND FASTENING THEM TO THE BAG (C AND D)

A detailed explanation of this diagram is given in the text

2. Decorate the front face as desired.

3. If no lining is used, sew the three edges of the face pieces together, using a french seam. The bag may be left open for three and one-half inches at the top. Finish the opening at the side separately by hemming or facing.

4. Turn and pin a hem around the top of the bag.

5. Make the straps for the handles as directed for Bag A.

6. Insert the handles as directed for Bag A. Secure the hem either by machine stitching or by a decorative stitch.

7. Bring the handles into place, and fasten them securely at the top of the bag.

8. Press the bag on the wrong side.

A PRACTICAL CLOTH HAT

ELEANOR HILLHOUSE
Instructor in Home Economics

A practical cloth hat suitable for everyday wear can be made by any school child. It is small, soft, close-fitting, with a rolling brim, and looks much like the white duck hats that sailors wear. It is especially suitable for girls and boys between the ages of twelve and sixteen years and can be made to fit any head. It may be made in various materials and thus adapted to any season.

A PRACTICAL CLOTH HAT

Materials.— For summer use, white duck, drilling, indianhead, or any other fairly heavy cotton material is good. Material that is too closely woven should not be chosen. It is necessary that the material stretch readily; therefore the stretching quality of the material across the bias should be tested. Pongee is also suitable if bias shrunk cotton or crinoline is used as a stiff interlining in the brim to give shape to the hat.

For winter, cotton and wool novelties in checks or small plaids, velveteen, or corduroy, is suitable. Bias crinoline may be used as a brim interlining for these heavier materials. One-half yard of thirty-six-inch material is needed for the hat. Three-quarters of a yard of fifty-four-inch material will make two hats. Or, since the hat is made in seven pieces, scraps of material left from other garments may be used. There must be enough true bias material for the brim, however, even though it has to be pieced two or three times.

STITCHING THE FOLDED EDGE OF THE BIAS BRIM

To obtain the individual head size.— To find the head size, draw a tape measure across the center of the forehead and around the head in an

even line, practically parallel to the floor. Do not let the tape slip down in the back. The measure should be taken rather snugly, and one inch added for comfort.

To make the bias brim.— Cut a true bias strip of the material six and three-fourths inches wide and the length of the head size plus one inch for seams. Sew the ends together, following the thread of the material as for piecing.

Press the seam open.

Place the bias edges together, and fold the piece so that it is three and three-eighths inches wide.

Stretch the folded edge as much as possible by pulling, taking care not to stretch the raw edges, which are to remain the correct head size.

An extra thickness of the material or of crinoline, cut on the true bias and stretched on the outside edge, may be put inside the folded brim piece to add stiffness. This piece should be three and three-eighths inches wide and the exact length of the folded piece, so that it will come just to the folded edge of the brim and extend to the head size.

Baste through the three thicknesses near the folded outer edge of the brim.

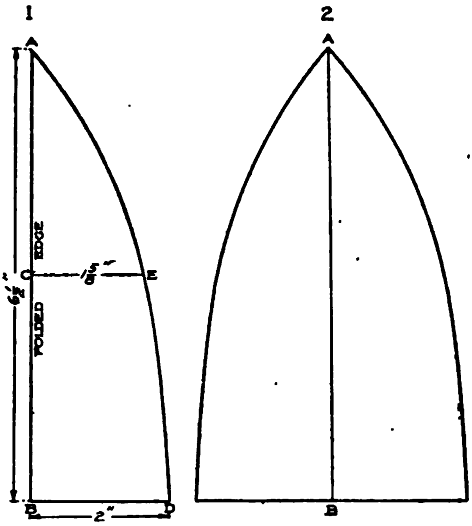


DIAGRAM SHOWING METHOD OF MAKING A PATTERN FOR THE CROWN PIECE

Explanation of the letters and measurements is given in the text

To stitch the brim.— Set the machine so that it makes twelve stitches to the inch, and stitch around the brim one-fourth inch from the edge. Put in successive rows of machine stitching one-fourth inch apart to within one-half inch of the inner edge of the brim piece.

To make the crown pattern.— The crown is made in six equal pieces. To make the pattern of one piece, divide the head size by six. For example, if the head size is twenty-four inches, four inches is the base of each crown piece. Fold through the middle a piece of paper eight inches square, and let the fold represent the center of one crown piece. Measure six and one-half inches on the folded edge, and mark this line AB, as shown in the illustration. Divide line AB in half, and mark this point C. From point B and at right angles to the line AB, measure half the width

of the bottom of one piece, or according to the example one-half of four, and mark this point D. From point C and at right angles to the line AB, measure half the width of the base minus three-eighths of an inch, and mark this point E. Connect points A, E, and D with a curved line, making the curve gradual. Following this line, cut through the two thicknesses of paper, and open out the fold. The result is the pattern for the crown piece.

COVERING THE CROWN SEAMS WITH TAPE

To cut the crown.— Using this paper pattern, cut six pieces from the material like the pattern piece, allowing for seams one-fourth inch on each rounded edge and one-half inch at the bottom. If possible all these pieces should be cut the same way of the material, all lengthwise or all crosswise.

To sew up the crown.— Allowing a one-fourth-inch seam, baste the edges of all the crown pieces together. Measure around the base of the crown, and compare it with the head size measure. If the crown is too large, it may be stitched inside the line of basting on every seam. If the crown is too small, it may be stitched outside the basting on every seam.

To join the crown and the brim for fitting.—Divide the head size of the brim into six equal parts, and mark these divisions with pins. Pin the crown to the brim, bringing a seam of the crown to each division on the brim. Make a one-half-inch seam that turns to the inside of the hat. Try on the hat. If the hat fits, take out the basting that holds the crown to the brim and stitch the crown. If it does not fit, it may be made either smaller or larger by stitching inside or outside the basting of the crown seams. If the head size of the brim is a little larger than the head size of the crown, hold the brim slightly full when basting it to the crown.

To stitch and finish the crown seams.— Stitch the crown seams on the inside. Open them out and press them. Trim the edges to within one-fourth inch of the stitching. Cover the seams and the unfinished edges with one-half-inch cotton tape. The tape is applied in three pieces so as

to avoid awkward joinings at the top of the crown, and as soon as one strip is carefully basted in place it is stitched before the next strip is placed. Starting at the base of one seam and continuing over the top to the base of the opposite seam, as shown in the illustration, baste the tape over the seam and the unfinished edges, being careful to have the center of the tape fall directly on the seam line, or on the line of stitching. If this is not done, the stitching will look very uneven on the right side of the crown. With the machine set so that it makes twelve stitches to the inch, stitch this on each edge, keeping the line of stitching very straight. On the right side of the crown the two rows of stitching should be equally distant from the seam line. After the first piece of tape is stitched, baste and stitch the second, and then the third.

Press the crown, being careful not to stretch the head size.

Stitch the crown and brim together in a one-half-inch seam on the inside of the hat.

To finish the head size seam.— Cut the seam at the head size to within one-fourth inch of the stitching, and turn both edges up into the crown. Cover these raw edges with a piece of one-half-inch cotton tape, sewing the lower edge of the tape on the line of the stitching of the seam and the upper edge of the tape to the crown. Stitch on both edges of this tape through the crown. This will bring two rows of machine stitching on the outside of the crown at its base. Press this seam carefully.

CARPENTRY APRON MADE OF DARK BROWN DENIM

CARPENTRY APRON

BEULAH BLACKMORE
Assistant Professor of Home Economics

This carpentry apron is designed for a boy about twelve years old and may be made by a boy or a girl. A much larger boy could wear this

same apron by lengthening the parts that come down over the knees. In order to be of the greatest protection, the lower part of the apron should come well below the knees. The apron should not be so wide about the waist that the boy's trousers pockets are covered. The upper pocket is intended for small tools or nails and should be placed so low that when the body is bent at the waist line the contents of the pocket will not fall out. The lower pocket is intended for the rule and should be placed within easy reach of the hand. For stitching the apron no. 40 thread should be used, and the sewing machine should be set so as to make ten or twelve stitches to the inch.

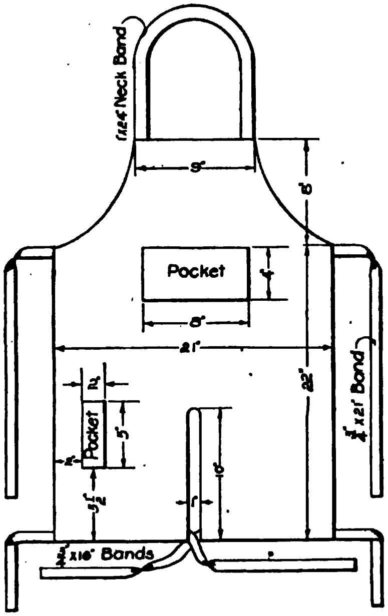


DIAGRAM SHOWING CONSTRUCTION OF THE CARPENTRY APRON

The measurements given in this diagram are for the finished apron

Material.— Denim or ticking is the material most commonly used. For an apron thirty inches long, about one and one-fourth yards of material is required.

To make the apron.— Cut the apron following the suggested design. All measurements may be taken from the accompanying drawing. These measurements, however, are for the finished apron; therefore allow three-eighths inch on all edges to make a one-fourth-inch hem.

When dividing the bottom of the apron do not take a piece out; simply cut the slash the desired length.

Make the straps as illustrated on page 233 for the handles of the book bag. Finish the ends by turning the unfinished edge to the inside.

Turn and baste a one-fourth-inch hem around the apron. As the hem is basted, slip the unfinished end of a strap under the hem at the correct place, so that when the hem is stitched the strap is also stitched into place. Reenforce the corner of the slash at the bottom of the apron by facing it in a slight curve with a bias piece of material or by facing it with a shaped piece. Stitch the hem in place.

Bring the straps up at right angles to the edge of the apron, and fasten them securely to the extreme outer edge of the apron.

Press the apron carefully.

Cut and hem the pockets. Crease a one-fourth-inch turn around the unfinished edges. Press them.

Try on the apron, and pin the pockets into place.

Baste and stitch the pockets into place.

Tie the threads of the machine stitching very carefully, for this apron is designed for hard usage. A good plan is to leave the threads long enough when the work is removed from the machine so that the ends may be threaded into the needle and several over-and-over stitches taken, especially when finishing the pockets.

RUG WEAVING

THE EDITOR

Rug making has been developed rather extensively in the rural schools of the second supervisory district of Saratoga County, particularly in District 11, Town of Milton. It is so worth while, so interesting, so practical, and offers such opportunities for activity in the spare moments of rural school boys and girls that all teachers should know about it.

The following material has been furnished by the district superintendent, the teacher, and the children, and the illustrations have been made from specimens of their work.

RUG WEAVING IN RURAL SCHOOLS

LOU MESSINGER

District Superintendent, Second District, Saratoga County

Interest in rug making was aroused in this district by exhibiting to the schools a pasteboard loom about nine by twelve inches. Holes were punched in it at each end at equal distances apart, and the warp was drawn through the holes. Some schools made rugs on looms of this sort, and some made them on similar looms of boards. Making board looms was too long a task, however, and an ingenious boy conceived the idea of placing the warp on tacks. Rugs were made for some time on this loom, but the desire grew to have larger rugs; so crosspieces were fastened on the ends of an old table twenty-one by thirty-six inches in size, tacks were placed in these crosspieces, and the warp was strung on these tacks. A rug as large as the top of the table could be made on this loom. Any school could make a similar loom, and it is a very convenient shape to work over. This idea originated with the teacher and pupils of District 11, Town of Milton, Saratoga County, of which Miss Anna Cavanaugh is teacher.

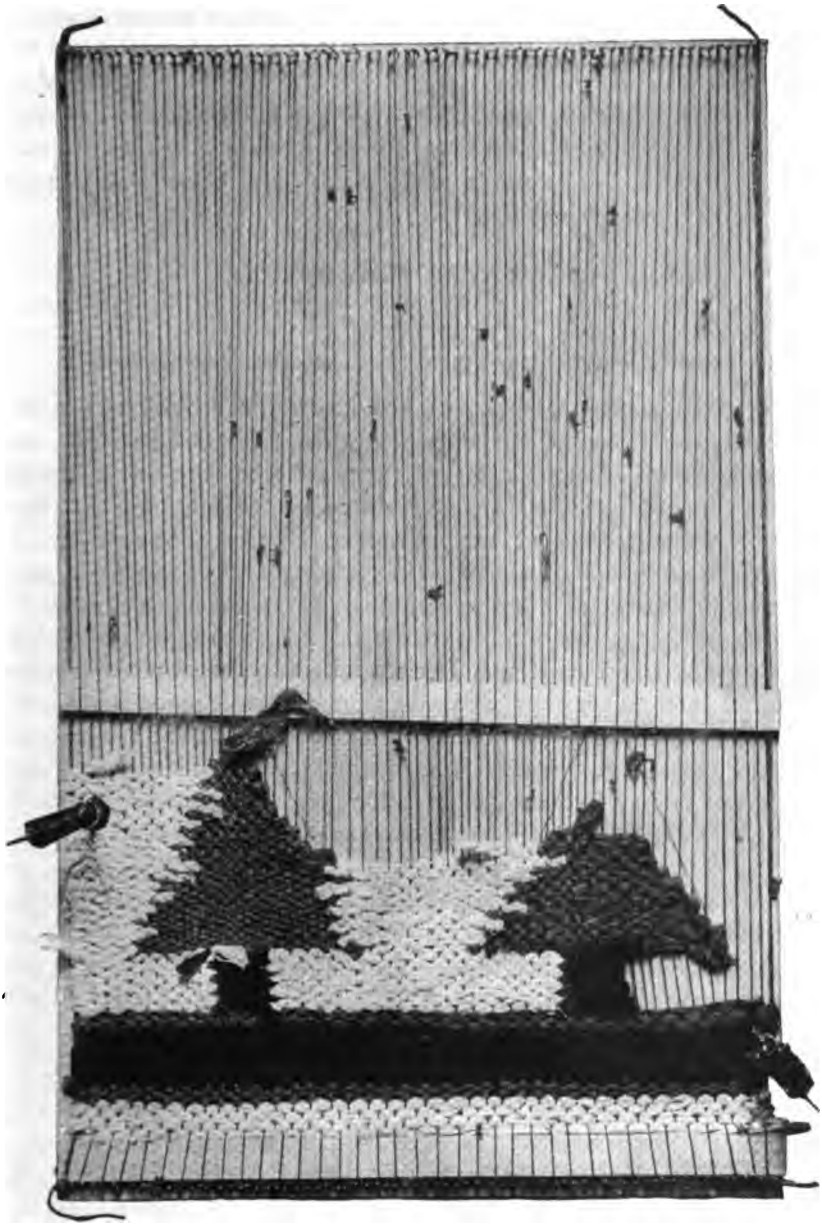
In weaving there are a few difficulties to be overcome. The edges must be kept straight, and any device that will accomplish this is satis-

factory. Miss Cavanaugh found that the clamps used by women in quilting would do this if the edge of the rug were clamped to the edge of the loom and the clamps moved as the work progressed. In her school a ribbon runner, or leader, was used in drawing the rag through the warp, but a satisfactory wooden needle was made in one of the schools. The rag must be pushed closely together so as to make a firm surface and so as not to show the warp. The pupils should not be discouraged if the first attempts are not entirely right, and the teacher should not accept any work as really complete until it is good.

RUG WOVEN IN A RURAL SCHOOL IN SARATOGA COUNTY

The designs in the rugs made in Miss Cavanaugh's school were worked out in various ways. The design was drawn either on paper or on the board of the loom. If on paper, it was slipped under the warp, and the weaving began at the ends and proceeded toward the design. A rug that has a border or a design should be begun at the ends and worked toward the center. When the design was reached, the rag was sewed to the other color, and this method was continued each time across the rug until the pattern was complete. If the design was geometric, the figure was placed first, and the background and borders were worked in afterward. Work can proceed more rapidly in this way, and sometimes more than one pupil can weave at one time.

For the material, pupils usually are asked to bring old c oth from home. If the right colors cannot be obtained in this way, the cloth may be dyed at school; or if a little new cloth is added, in many cases a very good effect can be produced. Miss Cavanaugh's school bought silk waste from a neighboring glove shop at fifteen or twenty cents a pound, and dyed it the colors needed for the designs. All colors may be used in



WEAVING A RUG ON A LOOM MADE IN A RURAL SCHOOL

The teacher and pupils of District 11, Town of Milton, Saratoga County, constructed this simple loom on which they have woven many rugs

making "hit-or-miss" rugs, but glaringly discordant colors should not be combined.

This kind of work when carried out in the right way produces results more far-reaching than we can measure. Pupils learn what concentration and application will bring about; they learn thrift; they learn that repeated attempts produce perfect results, and that results other than approximately perfect are unworthy.

RUG WEAVING IN MY SCHOOL

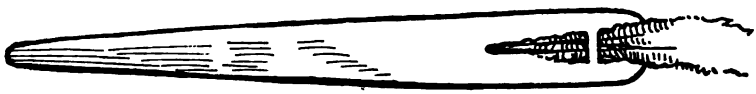
ANNA CAVANAUGH

Teacher, District 11, Town of Milton, Saratoga County

Three years ago Miss Messinger, our district superintendent, suggested rug weaving as a part of our manual training, and brought us a small cardboard loom. The pupils in my room are from the fourth through the eighth grades, so that the weaving of small rugs did not appeal to them. It was not difficult, however to make larger looms.

We used boards as the foundation of our ooms. In some cases boards wide enough were found, but generally it was necessary to fasten two together. With the small cardboard loom as a model we drilled holes one-fourth inch apart in each end of the boards. This was very tedious, and before these looms were finished one of the boys made a loom with tacks driven across each end of the board at equal distances apart to hold the warp. This plan was much simpler and soon even the girls brought looms. At present we are using table tops with strips across the ends to hold the tacks. I bought carpet warp and we strung it on the tacks.

Before weaving in strips of cloth a strip of wood one and one-half inches wide is woven in just as if it were cloth, close to the tacks at one end. This wooden strip serves as a firm support against which to press the strips of cloth as the worker weaves, and when it is removed after



RIBBON LEADER USED FOR DRAWING STRIPS THROUGH THE WARP

the rug is finished, there is plenty of warp to tie the ends. This is important, since the evenness and the firmness of the rug depend on the pressing back of the woven strips. A similar piece of wood is used to crowd the strips back.

As soon as a few strips are woven in, we hold the rug even with the edge of the loom by means of clamps such as are used in quilting. These can be procured at any hardware store at small cost. As the weaving progresses the worker moves the clamps, taking care to keep the edge of the rug even with the edge of the board.

METHOD OF TYING STRIPS OF RAG TOGETHER IN RUG WEAVING

A ribbon leader attached to the strips of cloth is a great help in drawing them over and under the warp.

Before weaving begins, we discuss appropriate color schemes and designs. A plan is decided on by the pupil who is to be the main worker. If a design other than stripes is used, the children draw and cut out the design and fasten it to the board under the warp. The design is then worked into the rug from this pattern.

This year we are weaving geometric designs by using a certain number of warp strings, dropping or adding during the weaving, as the case may require. These designs are woven before the background. In putting in the design the worker must not press the woof down hard until after the background is put in, as the strips of the background must be slipped in between the strips of the design. This type of rug is shown in the illustration on page 240.

The children in many cases furnish suitable material for the strips, and other materials needed for color combinations can usually be obtained at the remnant counter. Material may also be dyed if necessary. Medium-weight cloth is torn into strips one-half to three-quarters of an inch wide; heavier cloth into narrower strips; and lighter-weight cloth into wider strips. In some cases we sew these strips together, but usually we tie them, as shown in the illustration.

My reason for teaching rug making is that it is so attractive to children that they unconsciously acquire concentration, neatness, accuracy, and appreciation of color values. Also their interest never wanes, because it is renewed with each rug made.

All that I know about rug weaving I learned by experience.

HOW WE WOVE OUR RUGS

Letters from children in District 11

Ballston Spa, New York

When our looms are strung ready for use and we have chosen our pattern and colors, we cut our cloth into strips about three-fourths of an inch wide and paste our pattern on the loom. We are then ready for weaving.

RUG WOVEN IN DISTRICT II, SARATOGA COUNTY

We weave our cloth over and under the warp. If it is woven correctly, the strand of warp that was woven over on the first line should be woven under in the next line.

When we come to the design we cut the strip of cloth we are using for the body of the rug, and sew on the color we are using for the design. This method is followed until the rug is finished. We clip the warp on the ends of the rug and tie it. This loosens it from the board.

If fringe is desired we buy twine of the color of the design and put it on with the weavers' knot.

I have made three of these rugs. One is made of two tones of green combined with white. The other is made with the design of evergreen trees. The other was sent to the State Fair and took first prize. It was then sent to Albany.

Now I am making another rug. It has a design of a red house and evergreen trees. It is the most difficult one I have undertaken.

MARTHA A. RHOADES

I am going to tell you about a rug we are making now.

It is something like the one that has trees woven in (page 240), but it is on a much larger plan because we are using the top of a table for our

loom. The rags are silk, and weave in much better than cotton ones. We draw our pattern on the loom and are weaving in cloth of a brown and white mixture, which we made by tying knots n the cloth before dyeing it. Where the knots were, the cloth is white. We are combining this brown with green for the trees. For the ground work of the trees. we are using brown. When this rug is finished it will be the largest one we have made. We are going to give it to our district superintendent. Later on I am going to make one for the county fair exhibit. I have not finished planning the design, but I am going to use two tints of purple combined with white.

I like to weave very much. I like to do my other work also and I hope soon to enter high school.

ISABELL LILLIAN WILLIAMS

I am going to tell you how I made the rug that took the first prize at the county fair last year.

I made a loom because I could not wait for my turn on the others. I was so anxious to weave. Mamma gave me a piece of green calico with a small white figure in it. She also gave me some white cloth. I brought these to school and tore them into strips about three-fourths of an inch wide.

When the warp was on the loom I began to weave. First I wove eight strips of green, because Miss Cavanaugh said, "The first few strips must be like the body of the rug." Then I put in six rows of white. This was the border.

My rug was all finished in two days. We all liked it because it was so simple and the colors seemed to be just right for a rug.

In the fall I entered it in the school exhibit at the county fair. You cannot imagine how surprised I was when I heard that I had won the first prize.

A rug that I made went to Ithaca. It is in three tones of brown. I am glad I had the opportunity to send it. About two years ago I was at Ithaca and went all around Cornell University. I wish that I could go again at Farmers' Week.

KATHERINE BOWEN

PART III

FARM AND HOME MACHINERY

THE EDITOR

Many teachers will find the following discussion on machines of the farm and home exceedingly interesting and suggestive of worth-while work. Most children are fascinated by something that "runs" or "works," and always want to be around when a machine is in operation. This interest may be turned into useful and educative channels.

Professor Blodgett has given the following reasons why some treatment of machinery might well find a place in rural school work:

1. Machinery is coming into much wider use on the farm and in country homes. Its use is gaining headway faster than a proper knowledge of its care.
2. Proper care is the greatest factor in the conservation of machinery. Lessons on the care of machinery should begin with the young, in order that the fundamental principles may become a habit.
3. Work with machinery presents opportunities for developing in young people reasoning powers, observation powers, the ability to express themselves in words and in drawings, and opportunity for original thought.
4. Work with machinery, the practical results of which are strongly evident, will elicit the fullest sympathy and cooperation from the parents.
5. Work with machinery will invariably stimulate a desire for more knowledge about subjects allied to machinery, such as mechanical drawing, physics, mechanics, and the like. In some cases this will be the means of kindling a desire for continuing in school beyond the grades.
6. Work with machinery trains the head and the hand to act together.

Teachers to whom the work appeals and who undertake it with the boys and girls, will be helping others by reporting to the College the results that come both to the children and to the community.

MACHINES OF THE FARM AND THE HOME

W. K. BLODGETT

On the farm and in the rural home time-saving machines are supplanting much of the hand labor. Every day boys and girls living in the country come in contact with labor-saving devices, such as washing machines, cream separators, hay loaders, tractors, milking machines, home lighting plants, and the like, which a generation ago were considered as newfangled

fads or wholly unnecessary. Since these machines have become part of the farm and the home, should we not discuss them with our boys and girls and help them to understand the working of these machines and to appreciate their value?

GEARING UP

Of all the mechanisms involved in the simpler everyday machines, gears probably appeal to the young person first. What boy has not tried at some time to rig up something so that one wheel turns another wheel and that wheel another? He may spend hours making his invention work, with no other object than just to see it go. Let us direct his thought to something that works and has a reason for being.

Gearing up means arranging two or more toothed wheels, or gear wheels, in such a way that when one turns at a certain rate it makes another turn at a different rate. As a simple example, boys will be interested in studying the bicycle, and girls may study the egg beater. A hand drill would answer just as well.

On the egg beater is a large gear, the teeth of which fit, or mesh, into the teeth of one or more small gears. Turn the large gear around once by means of the handle. How many times does the small gear go around? Let this be done slowly so that the tracking of each complete turn of the small gear may be seen on the large one. If several different makes of egg beaters are at hand, it will probably be found that the speeding up differs. Ask the pupils who can tell, if an egg beater had forty-two teeth on the big gear and seven teeth on the small gear, how many times the small gear would turn for one turn of the big one. With help the pupils ought to be able to find out for themselves the principle involved in gearing up, that is, that the number of teeth on the large gear divided by the number on the small gear gives the number of times the small gear will turn when the large one turns once. If somebody can bring the works of a broken alarm clock to school, the accuracy of this rule can be checked up.

One or more bicycles may well be studied at this point. Turn the machine upside down, and with the hand turn the pedals over slowly. Observe the relation between the speed of the large sprocket and of the small one. Pupils will discover that their own bicycles differ in this respect. They probably have already noticed that one bicycle is driven up hill easier than another. Such a bicycle, commonly known as low-geared, should be compared with a high-geared racer in respect to relative speed of large and small sprockets. Mark with chalk on the back tire, and count the number of times this mark goes around when a pedal crank goes around once. Compare various bicycles in this respect.

Whether a bicycle is a so-called high- or low-geared machine is determined arbitrarily in the following manner: Multiply the diameter of the rear wheel in inches by the number of teeth in the large sprocket, and divide that by the number of teeth in the small sprocket. The result is called the "gear" of the machine. Sixty to seventy is considered low, while eight-five to ninety is high. Some machines are made with a gear as high as one hundred and twenty.

If the bicycle is compared with a small boy's velocipede, in which the pedals are attached to the front wheel and go around with it, the necessity and value of the sprockets and chain can be seen. Ask the boys why a low-geared bicycle is desirable when the rider has to push up many steep hills, and why a high-geared one is desirable for use on a race track.

It is apparent then that the various-sized gears, or sprockets, are used to change the rate of turning to another rate. In the two examples cited, a slow power is applied and must be speeded up. Similarly the reverse may be necessary. During the general discussion ask the pupils for examples of both increasing and decreasing speed by means of gears and by chain and sprocket wheels.

For detailed study the cream separator has been selected, because it is in general use. Other machines that might be substituted or added are a mowing machine, a lawn mower, washing machines, ensilage cutters, parts of a corn binder or a manure spreader, the gears on an automobile or a tractor. In all work with gears care should be used to avoid getting fingers or parts of clothing caught in the moving machinery.

THE CREAM SEPARATOR

A cream separator is essentially a device for doing quickly and thoroughly what gravity does for us when we set a pan of milk until the cream rises. Cream, or milk-fat, is lighter than the rest of milk; therefore the heavier part settles to the bottom of the pan and the cream remains on top. If we put milk in a pail and swing it on the end of a string, it will pull very hard on the string; the skimmilk being the heavier part will pull harder than the cream and will try to get away as far as possible. If we could turn the pail fast enough and long enough we would have the skimmilk farthest away, or at the bottom of the pail, and the cream at the top. We might then punch holes in the pail and draw off the two parts of the separated milk. The difficulty is that it is not practicable to swing the pail fast enough to separate satisfactorily the skimmilk and the cream. Therefore we must resort to a speeding up, or gearing up, device that will make the pail, or bowl as it is called in the cream separator, revolve very fast.

What is necessary in order to change the pail on a string into a cream separator? Our hands can turn a crank at some convenient speed, for

example, sixty times every minute. The bowl must turn 7200 times a minute. That is 120 turns of the bowl for 1 turn of the crank. If enough of the gears of a cream separator are opened to view — this can generally be done without much trouble — the teeth on the various gears may be counted, and the relation between the speeds of any two gears in the train of several gears, and the number of teeth that they have, may be discovered.

While one purpose of the various-sized gears is to change the rate of speed of the two turning parts, in many cases, as in the separator, there is another purpose. A boy ought to discover for himself that while straight or spur gears have their central axes, or the rods on which they turn, parallel to each other, bevel and worm gears change the directions of the axes. The worm gear is used in some cream separators and in parts of the automobile and the tractor. The simplest example of the bevel gear is in the ordinary ice cream freezer. This example is especially interesting, as the main bevel gear drives two bevel gears at the same time, one in one direction and one in another. The mowing machine and various other tools contain bevel gears. Of course the same rule in regard to the speed relations holds with worm and bevel gears as with spur gears and sprockets.

The provision for oiling the parts of the separator should be observed, especially the means of oiling the parts that move very rapidly. A special kind of oil is recommended by the manufacturer. Young persons cannot learn too early just how machines are lubricated. In the separator let them ascertain how the oil-feeding device is regulated so that it will feed the correct amount of oil in a given time. With the gravity glass cup oil feeder an adjusting screw is simply turned up or down until the correct number of drops fall by the sight glass in a minute.

THE THREE-HORSE EVENER AND LEVERS

Boys and girls will be interested in levers and their modifications. Teachers should avoid the conventional textbook method of treating this subject, which is to classify the levers into first, second, and third classes according to the relative positions of weight, power, and fulcrum. Such a treatment may rob one of the most interesting and universal mechanical devices of its fascination. Study the levers on the farm machines themselves, and let the pupils discover that these levers may be grouped into three classes according to their action. Of course the simplest lever, the crowbar or the straight lifting pry, is so obvious that it will pass without interest. More interesting examples are whiffletrees and eveners, pump jacks, speed-shifting levers, and the like.

The arrangement of the three-horse evener so as to allow each horse to pull his proper share of the load permits consideration of the mechanical

principles involved in levers. With narrow strips of board make a model of a three-horse evener. The pieces can be wired together. The effect of attaching them at different distances from the fulcrum, or center point, on the main bar may be studied by pulling at different places on the bar or by suspending the evener bar from a wire and attaching weights, such as bricks, at various points. In studying levers by means of a balanced bar, some allowance must be made for the unequal weight of the two arms of the mechanism itself. This will be almost negligible, however, if light strips are used. Boys and girls can readily be brought to discover the relation between the weights and the distances from the turning point, or fulcrum. For example, if three bricks are hung two feet from the suspending point, or fulcrum, they will be balanced by one brick suspended six feet on the other side of the fulcrum.

Besides the principle of the different weights supported by the two arms of the lever, attention should be called to the relative distance moved by the ends of the two arms as the lever revolves about the fulcrum, and also the difference in direction of movement. These principles are made use of in the shifting levers of all common farm tools. A man would not himself have sufficient strength to raise the knife bar of a mowing machine quickly, but by introducing a lever he can apply the strength of his arm through a long distance to produce a much greater pull through a comparatively short distance. Lead the children to discover examples of levers on some of the common tools, such as hay rake, hay tedder, mowing machine, mechanical milker, pumps, gas engine, gang plow, and wagon brake, and discuss the purpose and function of the lever in each case.

Encourage the children to make sketches of machinery. Of course finished drawings should not be expected, but a boy or a girl should acquire early the ability to describe a part of a machine accurately on paper. This will be of special value when some definite part of a machine must be described for repairs or renewal. Many mature persons fail utterly in this because they cannot express themselves in terms of machinery; for instance, they do not know the difference between a bevel gear and a sprocket, and a lever rod may be described as a rod or a "thingamajig." In any simple sketch of a machine insist that every line represent something and be there for some purpose.

CONSERVATION OF MACHINERY

Teachers can perform a great national service by leading boys and girls to form the habit of taking proper care of machines. The point of view is the same as in teaching human physiology. Children are taught to keep the human machine in repair and adjustment and to have it fit at all times to do its work; in like manner they may be taught to conserve farm and home machinery. It is a very old subject, and the teacher

must look carefully for a new and original angle of approach. Telling persons to pick up tools and machines, giving them statistics to prove the wastefulness of leaving machines unprotected from the weather, seem to make very little impression. What is needed to stimulate conservation of machinery is the point of view that is gaining so much headway in the conservation of human health. The watchword is prevention rather than cure. Large corporations, life insurance companies, and individuals as well, find that it pays in dollars and cents to have their employees and subscribers undergo periodic health examinations in order to forewarn of trouble. Following this principle, farm machinery should have regular care and inspection. To be able to repair a broken cultivator in the field is good, but how much better if the machine had been looked at before it was taken to the field and the loose nuts tightened. This is the point that teachers should emphasize in teaching conservation of machinery.

Why should not the boys arrange to care for some machine at their own homes? Let each boy choose, with the consent of his father, some tool in fairly constant use. The father will need to be a partner, for the work will have to be done according to his directions. The boy's work shall be, first, to keep the machine clean enough to perform its work properly. This does not mean that such a tool as a manure spreader should be cleaned thoroughly every time it is used, but it does mean that every part that clogs the moving parts or prevents proper oiling of the tool should be reasonably clean. Second, all nuts, bolts, and screws that have loosened due to operation should be tightened, and all parts that are badly worn or cracked should be noted for replacing. Third, and most important, parts that rub or turn on other parts should be oiled.

Many good machines go to the junk heap prematurely because they were not properly oiled. Directions for oiling given by the manufacturer of the machine should be followed. In many cases an oiling chart is furnished with a new tool. Following this chart, the boy should go over the machine from one end to the other, oiling each proper place, and become perfectly familiar with the places. He should always follow the same order. If an oiling chart was not furnished with the machine he may make one. The very act of looking the machine over carefully and charting every part that needs oil and grease will call his attention to points about the machine that otherwise would be missed. In many cases more than one kind of oil or grease is needed on the same machine; this should be noted on the chart. All holes, tubes, and cups supplying oil and grease must be clean. A handy tool to carry with the oilcan is a wire that has been hammered flat on the end. This can be bent in the form of a little spade to scoop out the dirt from the oil holes before applying the oil.

If several boys and girls in the school are caring for machines, they might be encouraged by reporting results from day to day at school on a general report sheet somewhat like the following in form:

Name	Machine	Work done that probably prevented field trouble	Field troubles, and causes
John Gray	Sulky plow	Nuts were tightened	

A special time set apart each week to report and discuss the work might also be profitable. The main object is to establish the value of keeping machines in fit condition to do their work by spending a proper amount of time on them every day before they are used. The general once-a-year cleaning and oiling of all the machinery has value, but cannot take the place of daily attention. Since the sole object of this work is to keep the machine in running order, unnecessary cleaning of heavy farm tillage machinery and useless polishing should not receive any credit. If a machine breaks down while under the special care of a pupil, the cause should be determined, if possible, for the purpose of noting whether that loss of time could have been prevented by more care in the inspection. If girls do not choose to care for farm machinery, there is generally plenty of house machinery to be kept in proper condition, such as oil stoves, washers, sewing machines, churns, and separators.

The money value of properly caring for farm tools is proved over and over again by practical farmers. Last summer a farmer of the writer's acquaintance bought his third mowing machine in eight years, while a neighbor, who has an equal amount of mowing to do each year, is still using the one he bought when the other man bought his first one. The second farmer looks over his machine carefully every time before using it, and keeps it well oiled. The first man has spent one hundred dollars for two new machines, and also has lost much time during the rush season in repairing breakdowns. The second man has spent a few minutes every day the machine was in use — possibly ten or twelve hours in the eight years. Surely, one hundred dollars is good pay for ten hours' work.

Thus from every point of view, whether in dollars saved the owner, or minutes saved during the busy season, or national conservation of machinery, proper care of farm and home machines pays. By giving farmers and farmers' wives of the next generation some insight into the working of machinery and starting habits of good care, teachers will be helping in reconstruction.

A POINT OF VIEW

EDWARD M. TUTTLE

Writing for the last time in this leaflet, I want to try to express some of the thoughts that result from seven years of close association with rural and elementary schools, and to take a bit of a look ahead.

In the first place, the educational world as a whole and, to a greater degree, the general public, still regard elementary education as lowest in the scale of importance. Work with little children is felt to be a little job, requiring little preparation and equipment, and worthy of only a little pay and support. To be sure there are evidences here and there that this attitude is changing, but it must change very greatly before our educational philosophy will be sound. The foundation of any structure determines the character of the building. Naturally the foundation is not conspicuous, it is not seen by the casual observer, and great courage and patience and spirit of sacrifice must be possessed by those who work there. The world now only begins to see and think about boys and girls after they get farther along — in high school, in college, at work. Then it finds much to criticize, and spends time and money doing, undoing, and changing things that would never have been wrong in the first place if the children had had a right start. Some day we shall turn ourselves about and realize that the best-prepared, most radiant, best-paid teachers should be in the lower grades, and that if we can build truly from the very beginning much of our present trouble and discussion as to the advanced stages will disappear.

The second consideration that appears to me far-reaching in its consequences is the current misconception of what real teaching is. As I was reading recently a bulletin published by the State Department of Public Instruction of Virginia, I was struck by the apt way in which Superintendent Eggleston summed up the situation. He said that the present philosophy of education may be expressed as "He who knows, will do." It is based on the belief that if we can give a child or a person knowledge enough, facts and figures, words and phrases, he will be equipped to do things. The result is that he learns a few tricks of life and proceeds to "put them over" largely in order to "do" his fellows to his own profit. Yet the philosophy of all true teachers from Christ down is quite the opposite, and may be expressed in the phrase "He who wills to do, shall know." In other words, equipment for life depends, first of all, on will or desire or spirit, and a person once possessing this moves directly toward his desire and acquires all the fact knowledge necessary to accomplishment. How this "will to do" or "will to live," as Henry Bordeaux calls it, comes to one is not easy to say. It comes through contact with some person who himself has it. This is the function of teaching in its

real sense — to inspire by example to great living, and in contact with young folk who are meeting life situations and the tasks of each day, to help them step by step to acquire a similar attitude of striving for the best, and broadest, and deepest possessions of life, which come through earning a livelihood and living in the spirit of service for the highest good of all. Thus our whole structure of fact knowledge is only a means to an end and not the all-important thing we sometimes tend to make it.

A third consideration in education that we must see clearly in the future, deals with the question of what after all is real equality of opportunity for each child. We pride ourselves on living in a democracy, where all men have an equal chance before the common law. But in the educational world we have interpreted equality as applying to things rather than to children. We have said that if we teach the same thing to each child of a given grade or age, we shall, of course, have treated them all fairly and equally. This is not so, for equality of opportunity has relation to growth produced and not to the thing taught. Two children receive equal consideration when each moves a like distance on his own road of life. But no two children are ever at exactly the same point on that road, and what helps one may not help the other at all. Thus to give to both, or to hundreds, or to thousands, identical treatment is the highest kind of injustice both to the individual and to society. Two things are necessary to overcome this: one is a development of public opinion not to regard concentration on the individual as partiality but rather as the highest service for the good of all; the other is to support education to such an extent that all individuals may be treated according to their potentialities. This is an ideal that has long been recognized by persons here and there, and always silenced on the ground that it will not work with such large numbers as now have to be dealt with. The argument is relative. "All uniformity tends to mediocrity," has been truly spoken, and, if civilization is to advance, the other way must be found. It is by no means impossible when we want it enough. The reason we keep moving at all now is that there are always teachers who build the individual and give him his chance in spite of every temptation and subsidy to do the easy, ordinary, other way. It is from such teachers that our leaders come.

A fourth thought in our educational development deals with the attitude of authority towards the schools and the teaching force. These are days when we worship efficiency, organization, and system. Everything must move with clocklike regularity and no friction; then we shall be obtaining "results." The results that we actually obtain under such a regime are humdrum, drab, and cheerless. The spirit is gone; movement is represented by beautifully revolving wheels, but there is no progress whatever. Here is a tremendous danger. We are likely to be killed by

our own invention, bewildered by the glitter until we lose the gold. Fortunately there are always those who cannot conform and who keep the breath of life in the schools. But they have a difficult time, struggling against the mechanical colossus. I do not mean that I would do away with organization; far from it, organization is needed to maintain a level, an average. But I would have those who guide the organization big enough to recognize those within it who are greater than the rules, and ready to give such a free hand. It is only in this way that progress can come, that new visions will open up, that the average can be raised. This is perfectly possible of attainment at present. It requires fearless leadership and true supervision that inspires rather than inspects, encourages rather than criticizes, believes rather than doubts. All cannot be treated alike. There are those who must have the organization to lean on; there are those who do not care either way; there are those whom the organization drags down. It is these last who hold the future in their hands, and whose spirit and energy must be released for the common good. This is no case of partiality; it is common sense, the greatest use of the best we have. In a very real sense teachers are public servants, they have no personal gain to seek that it is not tied closely to the gain of all of us. We must give them every chance, and that means that they have to be treated individually just as the children do.

The fifth consideration has gained more ground already than any of the others. It is the conception that a school is not of necessity a separate entity unrelated to the life around it, but rather that the truest school is a part of life, a concentrated part where young folk live intensely under the direction of one who has found life abundantly. This is the whole essence of the so-called nature-study movement. It should apply equally to every activity and study the children undertake. School and community are to-day joining forces as never before. Many of the resources of the home life of the children find their use in school, and much that the school suggests finds its application at home. A good deal of the will to do that was mentioned under the second point depends on seeing some purpose in the doing. Purpose is present only when the activity is real. Much that we have formerly done in schools, and still do to greater or less degree, has no point to the children. We say that it has point to us and that the children must take our word for it. The truth is that we may say so until we are black in the face, but we cannot force it to become a part of the boys and girls. They go through the motions, sometimes very well and with much applause from us, but at heart they are sick of it all and get out at the earliest moment. The things they need to begin with are the things they themselves live and find interest in. If we could only see that starting with these under competent direction, all the other things we are now so anxious about will come naturally in their

own good time and way because they will be needed. We are seeing this more clearly all the time, and the result is a new type of school to which boys and girls love to go and where they are happy in activity under one who never drives but only leads.

Finally, our problem in education is to help the world to better things. This depends on the highest development of the resources of mankind — the individual potentialities — and then on the harmonizing of these attainments into unity of purpose — the purpose being service for the good of all. Our problem is twofold then, and to some the two parts seem opposite. But they are not opposed, for the highest expression of the individual comes through the group. A school that most truly gives each child a chance according to his peculiar needs, will be found most successfully accomplishing the greatest movements which depend on unity and common spirit and interest.

These things are in many cases visions that are still far short of fulfillment, but I believe that they represent what we should keep before us as the goal toward which we are moving. It is good that we have so much to work for, and, as we approach the fulfillment of these, others and greater will open before us. Only let us be fearless to strive for big things and not be overcome by details that seem all important at the moment but that have little permanent consequence. The teaching of little children is, in the last analysis, a very simple thing. It consists in having them grow up in association with those of the race who embody its ideals and purposes most truly and most fully. There must come a day when such persons will be ready to give themselves to this most worthy of all building and when all the people will recognize and reward such service.

PHOTOGRAPH BY VERNE MORTON

REFERENCE BOOKS

The following are the titles, the authors, and the publishers of a number of books that have proved their value for reference use. They range in price from less than $1 to as much as $4. Prices can be obtained on application to the publishers.

1. NATURE STUDY AND ELEMENTARY AGRICULTURE

Nature-study leaflets (bound volume). College of Agriculture, Ithaca, New York. Available to teachers for 15 cents to cover postage
The nature-study idea. Bailey. The Macmillan Company, New York
Nature-study and life. Hodge. Ginn & Co., Boston
Handbook of nature-study. Comstock. Comstock Publishing Company, Ithaca, New York
Elements of agriculture. Warren. The Macmillan Company, New York
Agriculture. Benson and Betts. Bobbs, Merrill Company, New York
Beginnings in agriculture. Mann. The Macmillan Company, New York
Productive farming. Davis. J. B. Lippincott Company, Philadelphia
Essentials of agriculture. Waters. Ginn & Co., Boston
The great world's farm. Gaye. The Macmillan Company, New York
Sharp eyes. Gibson. Harper & Bros., New York
Eye spy. Gibson. Harper & Bros., New York

2. HOME MAKING

Clothing and health. Kinne and Cooley. The Macmillan Company, New York
Textiles. Dooley. D. C. Heath and Company, New York
Food and health. Kinne and Cooley. The Macmillan Company, New York
Household science and arts. Morris. American Book Company, New York
The theory and practice of cookery. Williams and Fisher. The Macmillan Company, New York

3. WOODWORK

Problems in farm woodwork. Blackburn. The Manual Arts Press, Peoria, Illinois
Agricultural woodworking. Roehl. The Bruce Publishing Company, Milwaukee, Wisconsin

4. PLANT LIFE

Plants and their uses. Sargent. Henry Holt & Company, New York
Principles of botany. Bergen and Davis. Ginn & Co., Boston
Manual of botany. Gray. American Book Company, New York
Our native trees. Keeler. Charles Scribner's Sons, New York
Our northern shrubs. Keeler. Charles Scribner's Sons, New York
Trees of northern United States. Apgar. American Book Company, New York
A first book of forestry. Roth. Ginn & Co., Boston
Manual of gardening. Bailey. The Macmillan Company, New York
Garden-making. Bailey. The Macmillan Company, New York
Cereals in America. Hunt. Orange Judd Company, New York
Corn plants. Sargent. Houghton Mifflin Co., New York
Field crops. Wilson and Warburton. The Webb Publishing Co., St. Paul, Minnesota
Textbook of grasses. Hitchcock. The Macmillan Company, New York
Field book of American wild flowers. Mathews. G. P. Putnam's Sons New York
A manual of weeds. Georgia. The Macmillan Company, New York
Our ferns in their haunts. Clute. Frederick A. Stokes & Co., New York
Mosses with a hand lens. Grout. O. T. Louis Company, New York
Mushrooms. Atkinson. Henry Holt & Co., New York

5. ANIMAL LIFE

Handbook of birds of eastern North America. Chapman. D. Appleton & Co., New York
Bird guide. Reed. Doubleday, Page & Co., New York
Bird homes. Dugmore. Doubleday, Page & Co., New York
Manual of the vertebrates. Jordan. A. C. McClurg & Co., New York
American animals. Stone and Cram. Doubleday, Page & Co., New York
American food and game fishes. Jordan and Everman. Doubleday, Page & Co., New York
The reptile book. Ditmar. Doubleday, Page & Co., New York
Beginnings in animal husbandry. Plumb. The Webb Publishing Co., St. Paul, Minnesota

Feeds and feeding (abridged). Henry and Morrison. The Henry-Morrison Co., Madison, Wisconsin
Productive poultry husbandry. Lewis. J. B. Lippincott Co., Philadelphia
Milk and its products. Wing. The Macmillan Company, New York
The horse. Roberts. The Macmillan Company, New York
Insect life. Comstock. D. Appleton & Co., New York
Moths and butterflies. Dickerson. Ginn & Co., Boston
The spider book. Comstock. Doubleday, Page & Co., New York

6. EARTH SCIENCE AND ASTRONOMY

New physical geography. Tarr. The Macmillan Company, New York
Soils. King. The Macmillan Company, New York
The children's book of stars. Mitton. The Macmillan Company, New York

7. NATURE POETRY

A child's garden of verses. Stevenson. Charles Scribner's Sons, New York
Songs of nature. Edited by John Burroughs. McClure, Phillips & Co., New York

IMPORTANT NOTICE

All teachers of elementary grades under rural supervision may receive the children's leaflets on request. This includes grade teachers in villages of less than 5000 population. There are not sufficient funds to send children's leaflets to cities and villages of over 5000 population.

It is urged that teachers cooperate to conserve the copies of the leaflet already distributed. These will be much more valuable for the school library as the years pass. In view of the fact that an index will soon be published the materials of the entire twelve volumes may be easily found for any topics discussed.

This complete index of the twelve volumes of the leaflet, now in process of preparation, will be mailed to each teacher for her school library, and copies of the leaflet for children will also be sent, provided the following information is mailed in before the supply is exhausted:

1. What copies of the Cornell Rural School Leaflets, teachers' and children's editions, from 1908 to 1917, are in the school library;
2. Whether or not a bound volume of the Nature Study Leaflets is in the library;
3. A statement of the five most perplexing problems that confront the country school-teachers in New York;
4. Without fail, the following personal information·

Teacher's name..

Post-office address (school)..

....

Post-office address (home)..

....

Number of school district..

Name of township..

Name of county...

Name of district superintendent...

Number of teachers in the school..

Number of pupils in your charge...

Amount of teaching experience (given in months).........................

Months of service in your present school......................................

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THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 135 — RURAL ENGINEERING SERIES — JULY, 1918

THE FARM ICE SUPPLY

B. B. ROBB AND J. L. STRAHAN

THE MILK HOUSE CONVENIENTLY LOCATED NEAR THE ICE HOUSE

Published and distributed in furtherance of the purposes provided for in the
Act of Congress of May 8, 1914

THE CORNELL READING COURSE FOR THE FARM

SUPERVISOR
ROYAL GILKEY

EDITORS FOR THE COLLEGE
BRISTOW ADAMS
RUTH VAN DEMAN

"Upon the farmers of this country in large measure rests the fate of the war and of the nations."—President Wilson, April 15, 1917

Under war conditions the skillful work of the man on the land has become more important than ever before. There is indeed every reason for zeal in increasing food production. Knowledge will help to make labor productive. Abraham Lincoln once said, "No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture." The College of Agriculture, thru the Reading Course for the Farm, offers twelve series of lessons for home study free to residents of New York State. The attached discussion paper gives details about these series. The reading course lessons are elementary and brief. Three advanced reading courses, in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods.

In a number of communities groups have organized for the discussion and study of common problems, and have adopted the name Cornell Study Club. The primary purpose of a Cornell study club is to furnish an occasion and an incentive for discussing reading course lessons for the farm and for the farm home, but the objects include the accomplishment of local improvements, the encouraging of cooperative buying and selling, and the bringing of outside speakers into the community. Cornell study clubs are educational and social centers, and should develop local leadership and the human resources of the community. Assistance is given in organizing and conducting clubs, and speakers are sent to clubs occasionally in connection with the regular extension work of the College.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

THE DAIRY HERD

HENRY H. WING

THE products of the dairy cow are fourfold. The first and chief product is naturally the milk which she secretes, and which is used as milk or for butter or cheese making. The second product is the calves which she bears, and which may be of more or less value. Third, the carcass of beef which she will yield when she is no longer useful for the production of milk, should be taken into account. Lastly, the manure she produces is of considerable value.

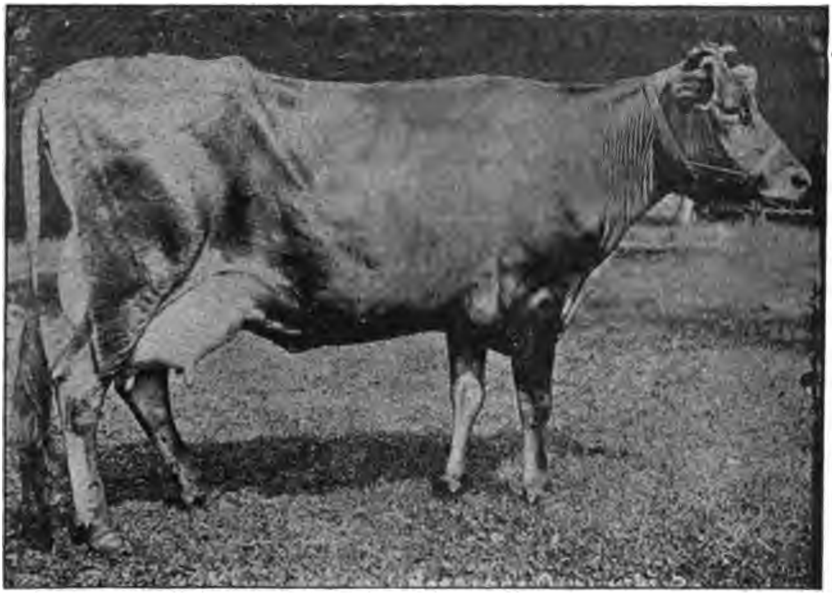

FIG. 25. THE SPARE, ANGULAR, WEDGE-SHAPED FORM DESIRABLE IN A DAIRY COW
The teats are well placed. Compare with figure 26

The milk may be called the main product, and the calves, the beef, and the manure the by-products, of the dairy cow. It has been asserted that the milk is the only product that should be taken into consideration in estimating the value of a dairy cow, and that the calves and the beef should be entirely ignored by a successful dairyman; but in these days of strong competition it is not possible to ignore the by-products, and in any scheme of successful dairying the calves and the beef must at least be taken into consideration. This does not mean that in any case milk-producing qualities are to be sacrificed for the sake of the by-products.

It simply means that of two animals of equal value for the production of milk, the one that will give the greater return in production of calves and value of carcass is the more profitable.

THE SELECTION OF THE HERD

There is no one best breed of dairy cows.—In the formation of a dairy herd one of the first questions to be considered is the choice of a breed and whether the herd shall be made up of purebred or grade animals. There are several well-known breeds of dairy cattle in the United States, each having distinct qualities and each having strong partisans. While, undoubtedly, some breeds are better fitted for certain conditions of soil

FIG. 26. THE SQUARE, BEEFY TYPE OF COW, USUALLY A POOR MILKER
Note poorly placed teats. Compare with figure 25

and climate than are others, still the matter of the choice of a breed may well be left to individual preference. In almost any location one may choose a breed for which he has a strong liking, either real or fancied, and be assured that he can establish with it a successful herd. Jerseys, Guernseys, Holsteins, Ayrshires, Swiss, Devons, Redpolls, and even Shorthorns, make a varied and fairly long list of breeds from which to select.

The comparative merits of purebred and grade cows.—Whether purebred or grade animals should be selected is a matter on which there may be more difference of opinion. By purely bred animals are meant those that are recorded in the herdbooks of their respective breeds. This is the narrow, restricted sense of the term *purebred,* but it is the one in common

use in this country. A grade animal is the produce of a purebred sire on a common, or grade, dam. The produce of a purebred sire and a common, or "scrub," dam is called a half blood; the produce of a purebred sire and a half-blood dam is called a three-quarters blood; a three-quarters blood bred in turn to a purebred sire will produce a seven-eighths blood; and so on *ad infinitum*. Since only the offspring of purebred parents on both sides are eligible to registry in the herdbooks of any of the dairy breeds, it follows that, no matter how far the process of grading up by the use of purebred sires on grade females is carried, purebreds, in the technical sense, can never be produced. Since purebred animals are sought for breeding purposes, the offspring of purebred animals are therefore more valuable and command a higher price than the offspring of grades. Hence, if the value of the calves is taken into consideration, a purebred herd is a more productive one, other things being equal, than a grade herd. On the other hand, by the grading-up process referred to, continually selecting the cows that are the best producers, it is entirely possible and by no means difficult to establish a herd of grade cows that will equal in the production of milk any herd of purebred animals. Hence, if the main product alone is sought, a grade herd may produce as largely as a purebred one; but if the by-products are to be taken into consideration, as it was stated at the outset that they should be, a purebred herd certainly has an advantage over a grade herd of equal productive capacity.

Maintaining the herd.—A dairy herd may be maintained in two ways. First, by continued purchase of mature animals to replace those whose period of usefulness has passed. There are many conditions under which this may be a wise practice. If it is desirable to have the whole herd composed of cows in their full productive capacity, if there is abundant opportunity for selection and purchase near at hand, if there is a reasonably good market for cows that are undesirable, and if one has reasonable skill in selecting and good ability in bargaining — a herd of high productive capacity may be more easily and more cheaply maintained in this way than by attempting to raise young animals to replace those that are worn out.

The other method of maintaining the herd is, of course, by raising calves to supply the place of old cows that are no longer profitable. Such a herd will always contain a considerable number of young animals that have not yet reached full development, and therefore such a herd will seldom equal in average production per animal a herd that is maintained wholly by purchase. At the same time a greater degree of uniformity of type may be maintained where the animals are raised. If land is abundant and cheap, the cost of raising a heifer, up to the time that she becomes

a fully developed cow, will be less than that of buying a similar animal outright. Through force of circumstances, by far the greater number of dairymen must rely on raising the calves necessary to maintain the herd. This being the case, the ordinary dairyman will need to provide himself with the services of a bull suitable to produce useful dairy cows. In most cases he will need to own this bull, so that the question of the selection and care of the breeding bull has an important bearing on the maintenance of the dairy herd.

The selection of the breeding bull.— It goes without question that such a bull should be purely bred. There are still far too many immature and ill-bred bulls in use. As a matter of convenience, a yearling bull is turned with the herd about the first of June, and in the course of two or three months when all or nearly all of the cows have become pregnant and he has fattened up, he is sold again at a price little, if any, below his cost, and the dairyman is without the trouble of the care of a bull for several months. If, in addition to this, l[illegible] attention is paid to the breeding of the bull, it is easily seen that little, if any, improvement in the character of the herd can be expected from his offspring. The progeny that a bull has already produced is by far the best index of his usefulness that a prospective purchaser can have. Cattle do not reach full maturity, in either sex, until they are about four or five years old. Consequently the best bull to select is a bull not less than four years old that has already begot cows of a high productive capacity. Such a bull is, of course, more difficult to control and more expensive to keep, but he is worth many times the trouble and expense as compared with an immature yearling.

FIG. 27. A POORLY FORMED UDDER, NOT REACHING HIGH UP IN THE REAR
Compare with figure 28

In the selection of a bull, much has been made of various so-called milk signs: rudimentary teats, milk veins, escutcheon, and the like. While each and all of these may be of some value, they are by no means to be set against the record that a bull has made in the production of his daughters. Other characteristics of the bull that indicate vigor of consti-

tution, good digestive organs, and vital activities in general, are a loose, mellow hide, a bold, bright eye, an active gait and disposition. These are of great importance as indicating capacity to reproduce similar characteristics in his offspring.

The management of a breeding bull.— The management of a bull on a dairy farm is often a matter of a good deal of trouble and perplexity. In a herd of ordinary size a single bull is sufficient, and it is usually necessary that he be kept from the herd during the greater part of the year. This means that he must be kept in solitary confinement. The result of this is, too often, that his temper becomes uncertain and his breeding powers impaired from lack of exercise. In all cases where it is possible to do so, it is better that the bull should run with the herd of cows. With a little care this can frequently be done, particularly during

FIG. 28. A WELL-FORMED UDDER, REACHING HIGH UP
Compare with figure 27

the summer and fall, when the cows are all pregnant in a spring calving herd, and in the spring and early summer, when the cows are all pregnant in a fall calving herd.

The powers and the temper of a bull may also be safeguarded by giving him exercise on a tread power, or hitched by a long rope or chain to a wire between two upright posts, or attached to a pole balanced on a post so that he may move around it. Occasionally, also, the labor of a bull may be utilized on a tread power for cutting feed, pumping water, or separating

milk. Sometimes a particularly handy owner will break a bull to work to harness or in a cart. It may even be time and labor well spent to give a bull walking exercise. A good, vigorous animal, carefully kept, should retain his breeding powers up to eight or nine years of age, or even beyond.

Weeding out the scrubs.— According to the census of 1910 the production of the 1,509,594 cows in New York State amounted to 6,657,309,540 pounds of milk, or 4410 pounds per cow. This indicates that the average cow of the State of New York is of little or no profit to her owner.

FIG. 29. THE PROMINENT MILK VEINS OF THIS COW WOULD LEAD ONE TO BELIEVE HER TO BE OF A GOOD DAIRY TYPE, IF THERE WERE NO BETTER WAY OF JUDGING HER

The first problem, then, of the successful dairyman is to separate the poor cows from the good ones. There is no means of determining the difference between a good and a poor cow except by keeping a record of her production. The knowledge of what a cow has already produced is of far greater usefulness as indicating what she is likely to produce in the future than any correspondence of her outward form with any standard, no matter how carefully the standard is devised or how skillfully she is judged by it. The successful dairyman, then, keeps careful records of the production of his cows and bases his selection on them. Since fat

is by far the most valuable constituent of milk, the usefulness of a cow is largely indicated by the number of pounds of fat that she produces in any given period of time. The number of pounds of fat that a cow produces is readily determined by knowing the number of pounds of milk and the percentage of fat that it contains.

In order to obtain a complete record of a cow, it is necessary that the milk be weighed and the fat determined at regular intervals. In determining the production of a cow the record may be complete or incomplete. A complete record requires a greater expenditure of time, labor, and care, but it gives an absolute record of the production. An incomplete record, requiring considerably less time, labor, and care, may enable one to make an estimate of the production that will be nearly or quite as valuable as an absolute record. The most perfect record is made by weighing and recording each milking, taking at the same time a small sample which is kept in a common receptacle during the period of a week, after which the fat is determined by the Babcock method. If this is too much trouble, the milk may be weighed at each milking and the fat determined in the milk of a single day at intervals of a month. This method has been shown to give results that are sufficiently accurate for all practical purposes.

Judging a dairy cow.— The regular use of the milk scales and the Babcock test is an indispensable part of the labor of the modern, progressive, successful dairyman. Still there are many occasions when it is desirable or necessary to form some estimate of the qualities of a cow where the information given by the scales and the Babcock test is lacking. There are certain characteristics of form that more or less certainly indicate the capacity of a dairy cow. Many become so skillful in recognizing these characteristics that they are able to separate good from poor cows to a highly useful degree. A knowledge of these characteristics is indispensable to a skillful dairyman.

It is generally recognized that a cow should be wedged-shaped, that is, the skeleton of the hinder portions of the body should be distinctly more largely developed than that of the forward portions. She should stand from half an inch to an inch and a half higher at the hips than at the shoulders. The width, as viewed from the front, should be distinctly wider behind than before, and the depth of the body as viewed from the side should be distinctly greater behind than before.

In order to produce large quantities of milk the dairy cow must also have vigorous powers of respiration and circulation. Since milk is formed from the blood, vigorous circulation is required to carry the blood in large quantities to the udder, and particularly to the minute capillaries. Vigorous powers of respiration are necessary to purify the large quantities of blood which must pass through the lungs. Vigor of respiration is indi-

cated by a large, deep, full chest, particularly wide on the floor; and by large, clean, open air passages, particularly the nostrils and the throat. Vigor of circulation is indicated by prominent exterior blood-vessels and by bright, pink complexion of the thinner portions of the skin and visible mucous membranes.

In order to secrete large amounts of milk, a cow must digest and assimilate large quantities of food. She must therefore have large powers of digestion, assimilation, and secretion. Capacity to digest is indicated to a certain extent by the size of the digestive organs, since a large part of the cow's food is bulky and she must have capacity to take in large amounts

FIG. 30. AN EXCELLENT THREE-QUARTERS-BRED COW, SHOWING WHAT A PUREBRED SIRE CAN DO IN TWO GENERATIONS

The grandmother of this cow was a rather poor milker. She herself produced in nine years, beginning when she was two years old, 96,800 pounds of milk and 3814 pounds of butter

of food in a short time. Vigor of assimilation and secretion is seen in the abundance and healthy condition of the hair, and in the softness and pliability of the skin and the abundance of secretion from it.

Good points in the udder.— More useful than any other outward characteristics of the cow, as indicating her capacity to secrete, is the size and condition of the udder. Naturally a useful cow must have a large udder, and, from the æsthetic point of view, the more regular in form it is, the better. The actual size and capacity of the udder, however, may not be indicated by its apparent size. In some animals the udder is held so close

to the walls of the abdomen and so great a part of it is hidden between the legs that it may appear smaller than a more pendulous udder of the same size, or even smaller. So, too, in judging of the quality of an udder its so-called fleshiness must be taken into consideration; that is, in some udders the connective and fatty tissue is so much more abundant that it occupies room that would otherwise be occupied by true milk-secreting follicles. Such an udder will be tense and firm, especially when empty, and will have little secreting capacity in comparison with its size. A so-called fleshy udder is approximately of the same size when empty as when full. An udder in which the greater part of the tissue is made up of milk ducts and secreting follicles will shrink rapidly as the milk is drawn from it, and when empty will be particularly loose, pliable, and flexible.

Popular milk signs.— In the cow, as in the bull, there is a considerable number of so-called "milk signs" that are relied on more or less implicitly by various people in judging or selecting cows. Foremost among these are the so-called milk veins. These milk veins never by any possibility contain milk, but form a system of exterior veins on the lower part of the abdomen that serves to convey a part of the blood from the udder back toward the heart. They vary in size, in length, in sinuousness, and in simplicity or multiplicity of branches. Inasmuch as their size indicates, to a certain extent, the amount of blood circulating in them, they may be considered as useful signs. The larger the veins, naturally, the larger the amount of blood flowing through them. A cow with a large, elastic, tortuous, and branching milk vein is likely to be a better cow than one less well-developed in this respect. However, the milk veins cannot be relied on implicitly as indicating the capacity of an animal to produce milk.

The milk veins usually enter the abdomen by one or more distinct perforations on each side, called milk wells or holes. A large perforation offers less obstruction to the vein and so impedes the circulation less, and to that extent is a useful sign; but to judge between the merits of two cows merely on differences in the size of milk wells is to carry the matter much too far.

It is now scarcely necessary to more than mention the milk mirror, or escutcheon, as the area of up-growing hair on the rear of the udder, thighs, and perineum is called. Variations in the size and shape of this area were seized on by the French writer, Guenon, as indicating the amount and duration of milk secretion. On these variations he constructed an elaborate table, showing the amount of milk that a cow possessing an escutcheon of a certain size and shape would give. Guenon had a large following for many years in this country, but at the present time scarcely any attention is given to the escutcheon.

It has been observed that an animal in which the joints of the skeleton are not too closely knit is likely to have good powers of assimilation. This has been seized on by those who consider what is known as the "open organization," as indicating great capacity to secrete. This loose-jointedness, or open organization, is well indicated by the distance between the vertebræ in the spinal column, so that the open, or loose, chine is taken to indicate good capacity to secrete. Doubtless it is of more or less value, but there are many animals that are highly satisfactory as producers that are not at all remarkable for looseness of chine, or open organization.

The size of the umbilicus is also taken as an indication of the capacity

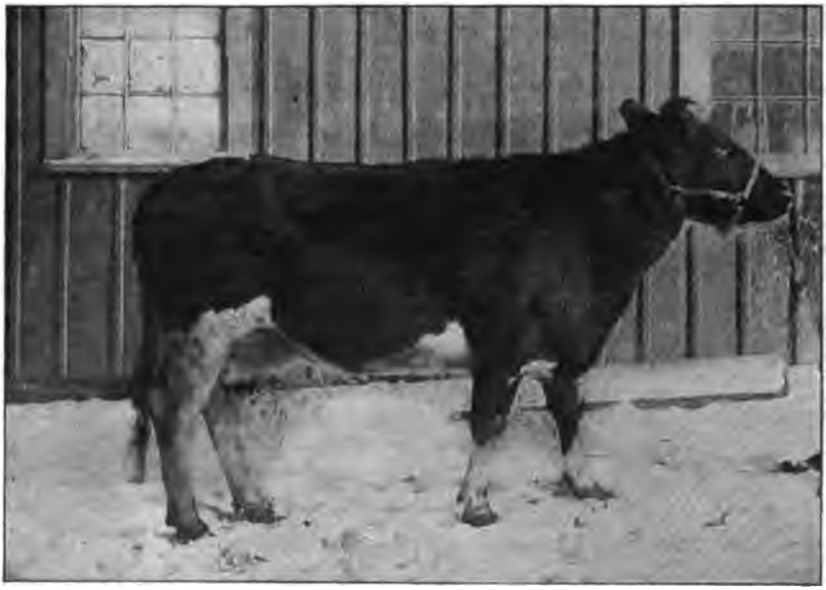

FIG. 31. THE BEEFY TYPE OF COW, USUALLY UNPROFITABLE IN THE DAIRY
She uses too much feed for laying on flesh, and too little for making milk. Compare with figure 30

of the animal to give milk. The argument of some is that a large umbilicus indicates that the umbilical cord in the fetus was large and the fetal circulation strong; and that such an animal, being strongly nourished in the womb by its mother, has thereby a stronger constitution than one with a small umbilicus. Careful observation has shown, however, that the size of the umbilicus is more of a breed than an individual characteristic.

There is a cord or fibrous band in the flank that varies in prominence and rigidity in different individuals. A strong, prominent band is taken as an indication of good powers of secretion. On the front part of the

bone of the tibia, just below the stifle joint, there may be detected a depression that varies in size in different individuals. A large depression at this place is supposed to indicate great powers of secretion. Its value, however, has never been conclusively proved.

Standards in judging dairy cows.— In order that a cow may be carefully examined in respect to the various characteristics just discussed, various standards, or scales of points, are in use, particularly by students in the agricultural colleges. The application of such a scale of points to any individual is called scoring, and skill in making judgment is attained only by carefully scoring a considerable number of animals. Such scales, or standards, while they correspond in the main features, differ more or less in minor details, according to the judgment of those who formulate them. Such a standard is given on page 1805 as a sample of those in ordinary use.

GRADING UP THE HERD

The successful and progressive dairyman will not only give his best efforts toward obtaining a herd that will make a satisfactory production, but will look to the future and bring about still further improvement by breeding from his herd succeeding generations that shall be even larger producers than their ancestors. Such a dairyman may, if he chooses, obtain as the foundation herd purebred animals that may be depended on to transmit their qualities to their descendants. But with even the highest-bred animals there will be the necessity for selection if the original standards of production are to be maintained, to say nothing of being increased. On the other hand, the large majority of dairymen seeking to improve their herds must depend more or less upon the individual animals they have already on hand as the basis from which to start the improvement. In either case, careful selection must be practiced, and a knowledge of at least the elementary principles of selection is necessary for progress along this line. It is proposed, then, briefly to indicate the lines along which an attempt to breed up or improve a herd of common native or mixed cattle is most likely to prove successful.

The first step in such improvement is in the selection of a suitable bull. Such a bull, besides being a well-developed individual with strong constitutional and vital powers, must be purely bred in order that he may have sufficient prepotency to transmit his characteristics to his offspring, no matter what may be the qualities of the females with which he is mated. He is likely to be found in a herd all the members of which are uniform in productive capacity and have been bred under the same conditions for a number of generations. A bull useful as a prepotent animal to mate with

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SCORE CARD

Dairy cattle

Scale of points	Perfect score	Points deficient: Student's estimate	Points deficient: Corrected
GENERAL APPEARANCE:			
Weight, estimated..........pounds; actual..........	......	......	....
Form wedge-shaped as viewed from front, side, and top	5	......	....
Form spare, as indicated by prominent joints and clean bone, and lack of muscular development along ribs and loins	8	......	....
Quality, hair fine, soft; skin pliable, loose, medium thickness; secretion yellow, abundant	8	......	....
Constitution vigorous, as indicated by alert expression, evidently active vital functions, and general healthy appearance	6	......	....
HEAD AND NECK:			
Muzzle clean cut; mouth large; nostrils large **Eyes** large, bright **Face** lean, long; quiet expression **Forehead** broad, slightly dished **Ears** medium size; fine texture **Neck** fine, medium length; throat clean; light dewlap	6	......	....
FORE AND HIND QUARTERS:			
Withers lean, thin; **Shoulders** angular, not fleshy	3	......	....
Hips far apart; not lower than spine **Rump** long, wide, comparatively level **Thurls** high, wide apart	5	......	....
Thighs thin, long	2	......	....
Legs straight, short; shank fine	1	......	....
BODY:			
Chest deep; with large girth and broad on floor of chest; well-sprung ribs	10	......	....
Abdomen large, deep; indicative of capacity; well supported	4	......	....
Back lean, straight; chine open. **Tail** long, slim, with fine switch	4	......	....
Loin broad	2	......	....
MILK-SECRETING ORGANS:			
Udder large, long, attached high and full behind, extending far in front and full; quarters even	20	......	....
Udder capacious, flexible, with loose, pliable skin covered with short, fine hair	10	......	....
Teats convenient size, evenly placed	2	......	....
Milk veins large, tortuous, long, branching, with large milk wells. **Escutcheon** spreading over thighs, extending high and wide	4	......	....
Total	100	......	....

Animal.................................**Date**.................................

Student.................................**Total score**.................................

common or mixed females is quite as likely to be the son of parents of something more than average merit as the offspring of what some are pleased to call " phenomenal " animals.

Select calves that show the good qualities of the bull.— In the improvement of a herd of cows it has been very common to recommend that the practice should be to use a purebred bull and to raise the heifer calves from the best cows in the herd. Whether or not this practice is correct will depend, to a great extent, on what is meant by the term " best cows." If it means merely that the heifer calves from the common cows that are the highest producers are to be raised, it cannot be accepted without qualification. The first and great step in improvement under such a course of breeding comes from the prepotent qualities of the bull. Logically, therefore, the best calves to raise are those in which the prepotent qualities of the male are most clearly shown at time of birth, such as in color markings or similar characteristics. These may or may not be the offspring of the highest-producing cows. Often the foundation herd of cows is admittedly inferior, even the best of them. If the proper judgment in selecting the bull has been exercised, there is in him greater chance for improvement than in any of the cows, even the best. It would therefore seem to be good logic and safe practice to disregard the qualities of the cow entirely in the first generation and depend on the prepotency of the bull.

A great advantage in the rapid improvement of a herd of cows under this grading-up process is the ability to raise a large number of individuals up to the time they begin to produce, so that a greater number may be available from which to select. In the first generation, therefore, it is a great advantage to be able to raise all of the half-blood heifer calves that are born strong and with good vital powers, irrespective of the qualities of their dams. In many cases, however, the circumstances of the owner do not admit of rearing so large a number, and some selection must be made at the time of birth. If it is conceded that it is not an entirely safe practice to base this selection on the producing capacity of the dams, some other basis of selection must be looked for.

Breed from cows that show variation, particularly toward improvement.— It is a generally accepted principle of heredity that an animal which shows a tendency toward variation is one that is not likely to be prepotent. Calves should be raised from cows that are not prepotent in order that the prepotent qualities of the bull may have full scope. Cows, then, that show tendency toward variation, particularly toward improvement, are logically the ones over which the male is most likely to be prepotent and at the same time the calves show the greatest tendency toward

improvement. It is comparatively easy to determine in any herd of cows those which show the greatest tendency toward variation, and more particularly those which show the greatest tendency toward improvement when their conditions are made more favorable. It can be determined then the cows from which it is likely to get the best half-blood heifer calves by giving the herd more and better feed and selecting calves from those animals which show the greatest improvement under such a change of treatment.

In actual practice it will be found that the animals that show the greatest increase in production under more liberal feed are not necessarily

FIG. 32. PROMINENT VEINS ON THE UDDER ARE THOUGHT TO BE AN INDICATION OF GOOD MILKING QUALITIES

those that were either the largest or the smallest producers under scant rations. This is shown in the following actual occurrence. A record was obtained of the yearly production, in pounds of butterfat, of a herd of nine cows that had been kept for a considerable period of time under scant rations. The succeeding year these cows were fed liberally — "liberal" in this case meaning practically all the food they would eat regularly — and a record of production was kept as before. The results are seen in the following table, the cows being arranged in the order of their greatest production the first year:

Cow	Pounds of butter-fat produced under scant feeding	Pounds of butter-fat produced under liberal feeding	Percentage of gain or loss
No. 1	177	303	gain 71
No. 2	174	258	gain 48
No. 3	172	314	gain 83
No. 4	169	108	loss 36
No. 5	157	276	gain 76
No. 6	154	274	gain 78
No. 7	132	148	gain 12
No. 8	129	267	gain 107
No. 9	125	232	gain 86

Now suppose that these cows the second year had all been bred to a pure-bred bull and that they all dropped heifer calves, but that it was possible for the owner to raise only four calves of the nine. If he had based his selection on those that were the highest producers, he would have raised the calves from Nos. 1, 3, 5, and 6. If, however, he had based his selection on those that showed the greatest capacity to improve under more liberal treatment, he would have raised the calves from Nos. 8, 9, 3, and 6. It is for each one to determine for himself which is the more logical practice.

Experience has shown that where the principles stated have been carefully carried out a very satisfactory improvement has been obtained in the first generation. It is not uncommon to find an increase of fully fifty per cent in the average production of half-blood cows over their common mothers. Experience has also shown that in the second generation the three-quarters bloods are not nearly so uniform as the half bloods and frequently show little, if any, increase in average production, though a few individuals will show a marked improvement. The question then comes as to how to obtain a greater uniformity and a higher average production in the second generation, or the three-quarters bloods.

Breeding the second generation.— If the selection of the original pure-bred bull has been a wise one and if he was a young animal at the time of his purchase, there will be a considerable number of his half-blood offspring ready to be bred while he is still in the zenith of his powers. Most breeders hesitate to breed such an animal to his own offspring, and it is seldom recommended. But if inbreeding is ever likely to be followed with useful results, it will be under just such conditions; and in proportion as both the bull and the half-blood heifers show strong individual

vital powers, the practice is to be recommended. In a majority of cases, the very best bull to breed to a lot of high-quality, uniform, half-blood heifers is their own sire, if it is desired to obtain greater uniformity and greater average production in their offspring. The reason for the lack of uniformity in the three-quarters-bred offspring is the fact that reversions occur to the qualities of their common and mixed grandmothers. It will require, then, even stronger prepotency to overcome this tendency to reversion, and the animal that is most likely to be prepotent over such half-bloods is their own sire.

Continued judicious selection the means of improvement.— It must be remembered that the improved production in the first place was obtained by improving the conditions of environment, which, so far as the ordinary dairy herd is concerned, means simply more food; and that it was perpetuated in the case of purebred animals by selection. Having obtained improvement now by the use of a purebred male on common or mixed females, it is, of course, necessary that it shall be maintained by liberal care and feeding. A purebred animal can transmit only its inherited tendencies, and if these inherited tendencies are not backed up by abundant and nutritious food the improvement obtained is sure to be lost. Having now obtained a marked improvement in two or three generations by the use of a purebred male on common or mixed females, with intelligent selection and intelligent inbreeding, the further course of improvement is the maintenance of proper conditions of environment and careful selection. As generations come on, characteristics of the original purebred sire will become more and more fixed and uniform, reversions will be less and less frequent, and the herd will be purely bred from the standpoint of the capacity of individual members to produce their characteristics, though they never become eligible to registration in a herdbook. This is a course that has been successfully practiced in the improvement of a large number of herds of dairy animals, and is entirely within the reach of any one of ordinary skill and intelligence.

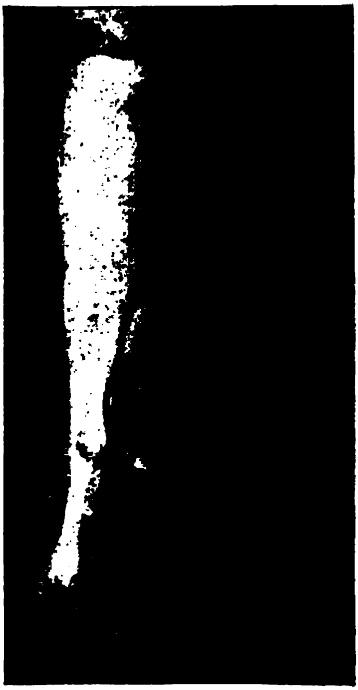

FIG. 33. GOOD HIND QUARTERS AND A PERFECT UDDER
Compare with figures 27 and 28

A specific case in grading up a herd.— As an illustration of this practice there is shown the improvement that was obtained in the case of the descendants bred from a single animal according to these principles.

The table shows the improvement in the descendants of an inferior cow by purebred bulls. Underneath each individual is given the number of years she was in the herd and her average yearly production in pounds of fat. Those indicated by a star are in the herd at the present time.

While the practice outlined has been particularly applied to the development and improvement of a herd starting with inferior or common

FIG. 34. AN IDEAL TYPE IN A YOUNG DAIRY COW
Note the fine head, horns, and legs, the well-developed chest, the strong hind quarters, and the large, well-shaped udder

cows as a basis, it should be remembered that the same principles apply equally well to any herd. There are very few herds, even the best of purely bred animals, in which the intelligent application of these principles would not result in marked improvement.

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THE DAIRY HERD

DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

The available reading course lessons for the farm are arranged in series on the following subjects: THE SOIL, FARM CROPS, LIVESTOCK, DAIRYING, FARM FORESTRY, FRUIT GROWING, PLANT BREEDING, THE HORSE, POULTRY, VEGETABLE GARDENING, FLOWER GROWING, COUNTRY LIFE. New readers may enroll in one or more of these subjects. The first lesson in the series is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. The reader may register for the Livestock Series by signing and returning this discussion paper. The space below on this page is reserved for registration in other series, and also for names and addresses of residents of New York State likely to become interested in the reading course.

(*Detach, sign, and return for the next lesson in this series.*)

(In answering questions, attach additional paper if needed and number the answers.)

1. What breed or grade of dairy cows do you keep? What are your preferences as to breed, and why?

2. What kind of a sire do you keep at the head of your herd? To what extent is he prepotent?

3 Do you keep a record of the production of each cow?

4. What was the average record of your herd for the past year in milk and fat?

5. In your judgment, how reliable are the points of conformation mentioned in this lesson? Give your opinion of each.

6. What experience have you had in grading up a herd? We should be glad to have specific records of production.

7. Have you made an estimate of the cost of milk production in your herd? Is it greater or less than the amount stated in the lesson?

Name..

Address...

Date..

(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 138 BEEKEEPING SERIES OCTOBER, 1918

BEGINNINGS IN BEEKEEPING

W. P. ALEXANDER

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THE CORNELL READING COURSE FOR THE FARM

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ROYAL GILKEY

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BRISTOW ADAMS
RUTH VAN DEMAN

"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture."—ABRAHAM LINCOLN

The progress of democracy depends ultimately upon the solution of human needs. Increased food production is the crying need of the world to-day. The next few years will call for the greatest skill in American agriculture. The combination of cultivated thought with labor increases efficiency in farming, which in turn means better profits and increased satisfaction in farm living. The College of Agriculture, thru the Reading Course for the Farm, offers thirteen series of lessons for home study free to residents of New York State. The attached discussion paper gives details about these series. The reading course lessons are elementary and brief. Three advanced reading courses, in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods.

In a number of communities groups have organized for the discussion and study of common problems, and have adopted the name Cornell Study Club. The primary purpose of a Cornell study club is to furnish an occasion and an incentive for discussing reading course lessons for the farm and for the farm home, but the objects include the accomplishment of local improvements, the encouraging of cooperative buying and selling, and the bringing of outside speakers into the community. Cornell study clubs are educational and social centers, and should develop local leadership and the human resources of the community. Assistance is given in organizing and conducting clubs, and speakers are sent to clubs occasionally in connection with the regular extension work of the College.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

SWINE PRODUCTION IN NEW YORK

H. A. Hopper

Livestock must hold a place of increasing importance on farms in New York State. Efforts to conserve farm resources more completely should take into account the immediate profits and the constructive results of a well-balanced livestock industry. Swine husbandry on some farms in this State is a neglected industry. A correction of present abuses and a high appreciation of the value of swine on most farms as a source of revenue are greatly to be desired.

Frequently useful residues and by-products go to waste, which might, with a little effort, be converted into pork. The possibilities of using these should be carefully studied on every farm. Obviously, the farmers of New York State cannot compete with pork producers in the Corn Belt, where both forage crops and concentrates are more abundant and cheaper, but it is not for this purpose that an aroused interest in swine production in New York is deemed advisable. There is much farm waste in this State that should be utilized, and it is incumbent upon the farmers to market some of it thru swine. Corn is not indispensable to profitable pork production. Denmark does not produce corn tho it is a great producer of pork and bacon.

A growing interest in swine husbandry in New York State is traceable to two things: higher prices for swine and their products, and a realization that the keeping of a limited number of pigs may tend to diversify the farm business. While possibly not every farm should have pigs, it is hard to conceive of a well-balanced farm without some pigs. Aside from any commercial considerations, the renewed interest in the home curing of meats for family use would point first to the pig as a source of supply. It is appropriate, therefore, to study closely the place of the pig in the farm management scheme. Americans are the greatest meat eaters in the world. So far as is economically consistent, this demand should be supplied with home products.

STATUS OF THE SWINE INDUSTRY IN NEW YORK

According to the agricultural census of 1917, there are less than 500,000 head of swine on farms in New York State. To this number should be added about one-half of one per cent to represent the numbers kept elsewhere. Since the hog is a prolific animal of relatively short life, the numbers are subject to rapid fluctuation in response to market and other conditions.

There are about 200,000 farms in the State. One-half of the farms report no pigs whatever; the other half have an aggregate of four pigs each. There are less than two brood sows on twenty per cent of the farms, and only thirty-three per cent have pigs other than brood sows. In general the counties with the largest numbers of dairy cows have the most swine.

In comparison with the census report of 1910, the report of 1917 indicates a decline of about twenty-five per cent in the number of swine kept on farms in the State during the past seven years. Advancing prices for pork products, as well as for supplementary concentrates, during recent years, have encouraged liquidation. With the prospect of continued high prices for supplies and pork products, the need for readjusting conditions of production in this State becomes apparent. In this connection the cooperative development of local marketing facilities should not be overlooked.

ECONOMY OF SWINE

Practical observation has long indicated the striking economy of pigs, and careful research has abundantly confirmed it. Under the present stress for economical meat production, the growing of pigs should appeal to many who have facilities to care for them. "Pigs produce a pound of gain from 4 to 5 pounds of dry matter, while fattening cattle require from 10 to 12 pounds. The pig yields from 74 to 80 per cent of his live weight as dressed carcass; the steer only 55 to 65 per cent." When compared with sheep and beef cattle in the amount required for gain, the superiority of the pig as a meat producer is established.

PLACE OF THE PIG IN NEW YORK

The New York farmer should not aim to compete with the Iowa or Illinois farmer in producing pork. There are definite reasons why this is true, which may be found in the relative cost of transporting live hogs or the grain to fatten them from the West to the East.

If it takes a bushel of corn weighing 56 pounds to produce 10 pounds of pork, which is cheaper to ship to New York, the finished hog or the grain to feed him until he attains a weight of 300 pounds? The average price of corn for the five years previous to 1915 is 78 cents per bushel in Iowa. The average freight rate on corn from Chicago to New York is 9.08 cents per bushel and on live hogs 30 cents per 100 pounds. The cost then to ship a 300-pound hog from Chicago to New York is 90 cents, while the cost is $2.72 to ship the corn required to grow the hog in New York. On that basis the advantage lies with the western pork producer.

The New York farmer, however, does have some local advantages in pig production with which the western farmer cannot compete. On most farms there are wastes that only a hog can utilize. These, together with nutritious forage crops, may be used to produce a few hogs each year on most farms without the addition of a large amount of expensive grain. There is a growing demand at all seasons for fresh meat that can be marketed locally with little cost for transportation. The prices for hogs on eastern markets are higher on the average than prices for hogs on any of the western markets. Thru the utilization of dairy, orchard, garden, and kitchen waste, diversity may be obtained and returns

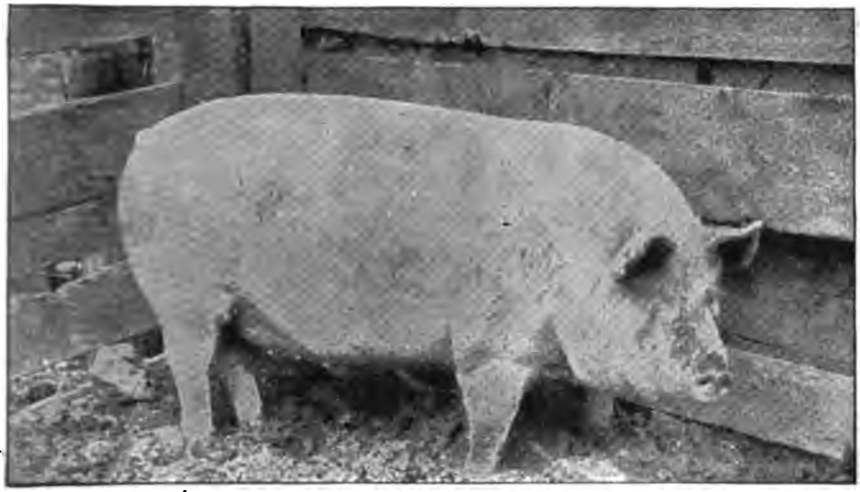

Fig. 48. CHESHIRE BARROW

increased. Within these lines there is opportunity, therefore, for the pig properly handled on many New York farms.

The main interest in swine husbandry in New York State probably originates in the desire to utilize various sorts of farm waste and by-products best suited to the growth and fattening of pigs. The swine industry is therefore likely to be incidental to rather than a main feature of the farm business. Even tho this is true, the need to study ways of properly conserving farm waste thru the pig is worthy of close attention. The futility of attempting to produce pork profitably when the animals are confined in pens or dry lots without forage crops and fed nothing but purchased mill feeds, is established beyond a doubt. In considering the question of conservation thru the pig, attention is turned first to the sorts and amount of available by-products to be fed.

FEEDS FOR SWINE

DAIRY BY-PRODUCTS AND THEIR USE

Since dairying is the leading agricultural enterprise of New York State, the dairyman's interest in pork production should be considered first. Where cheese factories and creameries exist, there are such by-products as skimmilk, buttermilk, and whey that may be returnable to the farm for feeding purposes. No dairy by-product from a cooperative or a central plant should be removed to a farm without first being thoroly pasteurized. This prevents the spread of a number of communicable diseases that otherwise would be easily carried by the raw by-product from farm to

FIG. 49. CHESHIRE SOW

farm. Pigs following tuberculous cattle or fed on unpasteurized milk from cows suffering with tuberculosis, become affected with the disease themselves. However, with proper precautions dairy by-products can be used without harm and constitute a valuable source of revenue.

FEEDING VALUE OF SKIMMILK AND BUTTERMILK

Skimmilk and buttermilk are ideal feeds for brood sows and growing pigs. Since these feeds are rich in digestible protein and supply mineral matter in an efficient form, they are best fed in combination with carbonaceous foods. Corn, barley, or wheat when supplemented not too generously with skimmilk or buttermilk yield economical returns. With pigs weighing about one hundred pounds, a pound of cornmeal, or its equivalent, to about three pounds of milk has given most economical gains.

More milk may be fed to advantage to younger pigs if it is abundant, but the returns are not so high with older pigs as when the ration is more evenly balanced.

When in good condition and no water has been added, buttermilk is equal to skimmilk in the production of gains on growing pigs. In starting pigs on either buttermilk or skimmilk care should be exercised to avoid overfeeding. For very young pigs sweet skimmilk is probably preferable to sour milk. Certain trials have shown pigs getting sour milk to be more thrifty than those getting sweet milk. If the milk is wholesome, sourness is no objection. It should be the same each feeding either sweet or sour. Milk of either kind fed alone gives only about half as rapid gains as when fed in the ratio of one part of a good grain mixture to three or four parts by weight of milk. In a general way the money value of skimmilk when used with corn for fattening pigs weighing one hundred pounds or over is indicated in table 1.[1] With pigs weighing less than one hundred pounds the larger allowance of skimmilk should prove most profitable.

TABLE 1. MONEY VALUE OF 100 POUNDS OF SKIMMILK WHEN USED WITH CORN FOR FATTENING PIGS

Cost of corn		When one pound of cornmeal is fed		Average of all trials
Per ton	Per bushel	With 1 to 3 pounds of milk	With 7 to 9 pounds of milk	
$16	$.45	$.24	$.15	$.17
18	.50	.28	.16	.19
20	.56	.31	.18	.21
30	.84	.46	.27	.32

Whole milk rich in butterfat has been found unsatisfactory for young pigs. In comparison with skimmilk, whole milk is worth only about twice as much for general pig feeding. This in connection with the high market value of butterfat makes the use of whole milk in pig feeding impractical.

Buttermilk and skimmilk contain certain vital nutrients that such foods as middlings and tankage do not have. An almost negligible quantity of either, in addition to other balancing effects on the ration, may supply the necessary vital elements to promote complete growth in the young pig. Some milk fed at the right time may make the difference between a good pig and a poor one. A little milk works wonders in pig feeding. If the quantity is limited, it should be distributed among the

[1] This table is adapted from *Feeds and Feeding*, by W. A. Henry and F. B. Morrison.

young and growing ones, rather than given to a favored few. The high value of buttermilk when fed in small quantities to weanling pigs on a grain ration with tankage is shown in table 2, which is quoted from John M. Evvard.

TABLE 2. GROUPS OF WEANLING PIGS FED FOR 100 DAYS IN A DRY LOT

	Group 1 fed on shelled corn, wheat middlings, and tankage	Group 2 fed on shelled corn, wheat middlings, tankage, and buttermilk
Initial weight per pig, pounds	42	42
Final weight per pig, pounds	155	160
Average daily gain per pig, pounds	1.13	1.18
Average daily feed eaten per pig, pounds		
Shelled corn	3.40	3.54
Wheat middlings	.61	.44
Tankage	.62	.43
Buttermilk	None	1.84
Pounds feed required for 100 pounds gain		
Shelled corn	299.90	299.70
Wheat middlings	53.50	37.00
Tankage	54.60	36.00
Buttermilk	None	155.80
Cost 100 pounds gain, buttermilk at $.25 per hundredweight	$5.90	$5.58
Cost 100 pounds gain, buttermilk at $.455 per hundredweight	5.90	5.90
Profit per pig at $7 per hundredweight, buttermilk at $.25 per hundredweight	1.25	1.68

All these feeds were self-fed except buttermilk, of which each pig received not quite a quart once daily. Pigs had access to bone ash, charcoal, and rock salt, but ate very little; hence these items are not charged in this computation.

OTHER RESIDUES

On the farms of truck-growing and fruit-raising regions of the State there are varying quantities of waste material of relatively high feeding value for swine. Much of this waste can be conserved and fed over a considerable period, but a good part of it is very perishable. Many such farms may well plan to keep a few brood sows to furnish pigs to consume this material when most abundant. This should be a practicable scheme in view of the ease with which a mature brood sow may be kept from one season to the next.

Many pigs are fed largely or exclusively on waste from hotel kitchens, restaurants, or bakeries. Such wastes of a mixed character are likely to

be very nutritious, and, if in wholesome condition, the animals should thrive. Care must be exercised to avoid the admixture of soaps and washing powders likely to occur in dishwater. These together with salt in excess will be likely to prove fatal to pigs. Residues from cracker factories and bakeries need to be supplemented with protein feeds as they are too carbonaceous.

There is serious danger that pigs may contract disease or meet death from the presence of injurious substances when fed on garbage. For this reason, the sows and pigs used in such an enterprise should be well inoculated with hog cholera vaccine. In spite of every precaution the difficulty of excluding all foreign substances and poisonous materials renders the undertaking hazardous.

PASTURE AND FORAGE CROPS

Under any conditions, the cost of pork production is materially reduced by the use of pasture and forage crops. For satisfactory results it is usually desirable to supplement these feeds with some grain, especially when the animals are being finished for market. Exclusive pasture even of good quality is hardly sufficient for the young and growing pig. While the value of pasture and green forage for pigs in New York is generally recognized, it is not given the attention that its importance demands. Close yarding and a ration of expensive purchased concentrates cannot prove profitable. A life of comparative freedom, in contact with the soil and with access to fresh, green, nutritious crops, furnishes the elements for profitable pork production. The owner or operator controls these factors; therefore it rests with him to make the pigs pay as they should.

RYE AND WHEAT

For late fall and early spring pasture, rye and wheat are valuable. In this State, they should be seeded usually late in August and will thus make fall, winter, and spring pasture for pigs. Pigs should begin to pasture cereal crops when the plants reach a height of six to eight inches, and should be taken off when the plants become so mature that the pigs begin to spit the chewed material from their mouths. Green wheat, oats, rye, and barley, when fairly mature, are classed as carbonaceous, but in their early stages of growth they are nitrogenous. Since they are but slightly affected by frost, they are the most useful crops for pigs during late fall and early spring.

THE GRASSES

Bluegrass and other natural pasture grasses are satisfactory for spring and early summer until drought retards growth. With the exception of rye, bluegrass furnishes the first green feed in spring, and it should be

fully utilized. With the advent of hot weather, however, hogs should have access to other forage crops, as bluegrass will not be available until revived by the fall rains. Orchard grass, especially in shady pastures, comes earlier than bluegrass, and is fairly good for pigs.

CLOVER

Whether clover is a satisfactory forage crop depends largely on the season, success in getting a stand, and the stage of maturity when fed. In combination with corn, clover makes one of the best feeds for cheap pork production. In view of its tendency to kill out, clover fits better in a rotation with other plants than in intensive plot culture. The usual cultural requirements for this crop should be followed in attempts to use it in New York. It is relished by pigs and can be harvested by them to advantage by the use of hurdles or temporary fences.

SWEET CLOVER

Sweet clover, which until recently was looked on as a weed, is coming to be recognized as having a wonderful value as a pasture or forage crop. It suffers little from drought, and stock, especially hogs, do well on it.

There are three common species of sweet clover, one of which, *Melilotus alba*, the white-flowered sort, is preferred for most purposes because of its sturdy vigorous growth. It can be seeded almost any month of the year, and prefers a hard seedbed and rather scant covering of the seeds. If covered too deep, it will not germinate. Sweet clover seed germinates with difficulty because of an impervious seed coat. A machine called a scarifier has been perfected, which abrases the seed and thus insures higher germination. Seed sown in winter need not be scarified. The seed should be applied at the rate of ten pounds per acre. Inoculation of the soil and applications of lime are recommended.

ALFALFA

Alfalfa is probably not widely enough grown in the State to be a real factor in pig feeding, but its merit is established beyond question. Since it is a legume rich in protein, it has the same value as clover, vetch, and the like in hastening maturity and reducing the need for nitrogenous concentrates. It will not endure heavy pasturing. It should be stocked to about half capacity and the new growth cut regularly for hay. A good stand will produce four hundred to five hundred pounds of pork per acre.

CANADA FIELD PEAS

Canada field peas sown with a cereal, such as oats or rye, make an excellent early forage crop for hogs. The seed should be sown early and covered deeply to insure the best growth. When possible a moist, cool,

well-drained soil should be selected. The crop grows rapidly under right conditions and will be ready for use in early June in conjunction with or following clover. This mixture is usually sown at the rate of one and one-half bushels each of the peas and the cereals used. On heavy soil the crop may lodge, but pigs will clean up the vines and peas well with little waste. The crop comes to maturity quickly as hot weather approaches, so that to insure best results two or three small areas should be planted at intervals of about ten days. Feeding these off in succession gives an extended period of uniform forage. The bacterial inoculation of the field pea is recommended.

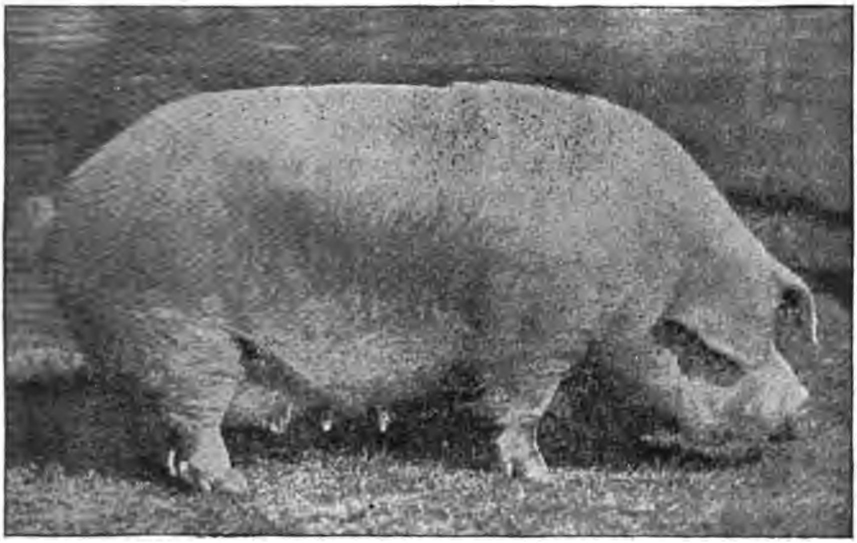

FIG. 50. CHESTER WHITE SOW

HAIRY VETCH

Hairy vetch is a biennial legume of increasing importance as forage for swine. It should succeed wherever field peas do well, but as yet the latter are preferred. In many parts of New York hairy vetch thrives, and its use as a forage crop is increasing. Vetch may be planted in the summer or the fall with rye and thus furnish valuable pasture the following spring. The seed or the soil should be inoculated to insure full growth of vetch.

DWARF ESSEX RAPE

The rape plant as a forage crop for hogs is highly recommended wherever grown. When planted in the spring it is ready to pasture in six or eight weeks. In this climate it will not survive the winter. It is recommended that rape be planted in small areas at intervals of two or three weeks. About three plantings should be made. The Dwarf Essex variety is in

highest favor and is sown in drills twenty-eight inches apart at the rate of two to four pounds to the acre, or broadcast at the rate of four pounds to the acre. For fall feed, it may be sown in corn at the last cultivation.

When pigs are put on rape, it may take them sometime to develop a taste for it; young pigs do not make so good use of rape as the older ones. The plants on the first plot seeded should be fifteen inches high before the pigs are turned in. The rape stalks should not be too closely pastured, for they will grow up again while the later seeded plots are being used.

For less intensive feeding, where fewer animals are to be kept per acre, rape is sometimes sown broadcast with oats and clover at the rate of four pounds of rape, eight to ten pounds of clover, and one bushel of oats per acre. In this mixture eight to ten pounds of sweet clover could be used, and excellent pasture maintained a second year. The pigs should not be turned into this until the crop is from eight to ten inches high, after which each acre with a good stand of the crop will supply fifteen spring pigs with forage for the rest of the season. Under favorable conditions rape will produce four hundred to five hundred pounds of pork per acre during the season.

OTHER SEEDING MIXTURES

In addition to the forage crops already mentioned, there are other valuable seeding mixtures used. Local practices may offer excellent suggestions. Pumpkins and roots yield valuable crops that pigs may well harvest. Most of the green forage crops, especially if they contain a legume, may be depended on to cut down the grain required to grow and fatten a pig at least twenty-five per cent.

The eastern hog feeder has been slow to recognize the value of forage crops for hogs and the advantages incident to permitting them to harvest crops for themselves. Western feeders commonly practice "hogging down" the corn crop. Easterners have been slow to accept this practice, as a high value attaches to the stalk for other purposes. Aside from this fact, the practice is not wasteful where labor is expensive. It will probably pay even in New York to let hogs harvest part of the grain in the form of corn designed to finish them. If soybeans are planted with the corn, the pigs will harvest each crop and in a measure be able to balance their own ration.

PRECAUTIONS

Pigs given access to green forage are usually more thrifty and make faster gains than those handled otherwise, and, if wisely managed, there need be no waste. In order to get best results the crop should be carefully seeded, fed when ready, never overstocked, nor needlessly trampled when the ground is wet. An acre of these crops can be so handled as to supply forage from June until October for fifteen to twenty spring pigs.

The pigs should not be turned in until the crop has a good start and should be taken out for a few days after heavy rains, as the pigs may do great damage by trampling and rooting the crop.

GRAIN ON PASTURE

While the cost of pork production is reduced by the use of green feeds, an addition of grain is desirable. The pig is omnivorous, with small capacity for exclusive forage feeding. Grain gives best returns when the pig is young and on pasture. From one-half to three-quarters of a grain ration should be allowed at this time.

Young growing pigs and those to be finished in seven to nine months must necessarily have grain in addition to pasture to reach the weight demanded by the market. In the absence of grain, pigs and shotes on pasture may become stunted and the cost to finish them thereby increased. Rapid gains come early in life. When the fattening period is reached, grain should be given freely, if the pigs are to be fully finished.

Frequently mature breeding stock may be kept on good pasture alone when no gain is expected. Hogs that are nearly grown may be kept on good pasture without other feed and make slight gains.

The place of forage crops in economical pork production is established. "As a result of three years' work in Iowa, it was found that the best dry lot gain cost with 50-cent corn, $4.36 per hundred as compared with $2.88 on alfalfa pasture, $3.69–$3.84 on red clover, and $3.63–$3.95 on rape. The gains were also less rapid in the dry lot than on pasture." In a Kansas trial, the lot receiving ground corn in a dry lot made only one-third the gain made by those receiving ground corn on alfalfa pasture, and consumed twice as much grain to produce a pound of gain.

A succession of forage crops to keep pigs growing is a matter of first importance. The usual order in which the crops will become available with the rate of seeding and the time of sowing is given in table 3.

TABLE 3. FORAGE CROPS FOR SWINE

Crops	Time of sowing	Amount of seed to sow per acre	Period available
Rye............	July to September.....	6– 8 pecks...	Fall and following spring
Wheat.........	August 20............	6– 8 pecks...	Fall and following spring
Clover.........	Spring...............	10–15 pounds.	Fall
Alfalfa.........	Spring or summer.....	20 pounds.	Following season
Hairy vetch.....	March to April with oats, or fall with rye.	10 pounds.	Fall and following spring
Dwarf Essex rape	March to August......	2– 5 pounds.	Same season
Peas and oats...	April 10–15...........	1½ bushels each	After June 15

FEEDING CONDITIONS

Contrary to popular belief, pigs are creatures of cleanly habits and in order to do well require as wholesome feed as other domestic animals. The consumption of filthy feed retards and impairs digestion, threatens health, and reduces the gain. All arrangements for feeding should recognize these facts. Nature's methods are best with such slight changes as necessary control and housing impose. The pig's feed should not be allowed to become contaminated with his own excrement. When the pigs are on green forage, this is a simple matter to prevent; but when they are confined in muddy yards or pens, this is difficult. Therefore proper troughs and a feeding floor or a self-feeder are necessary to best results and will return their cost in a single year thru better gains.

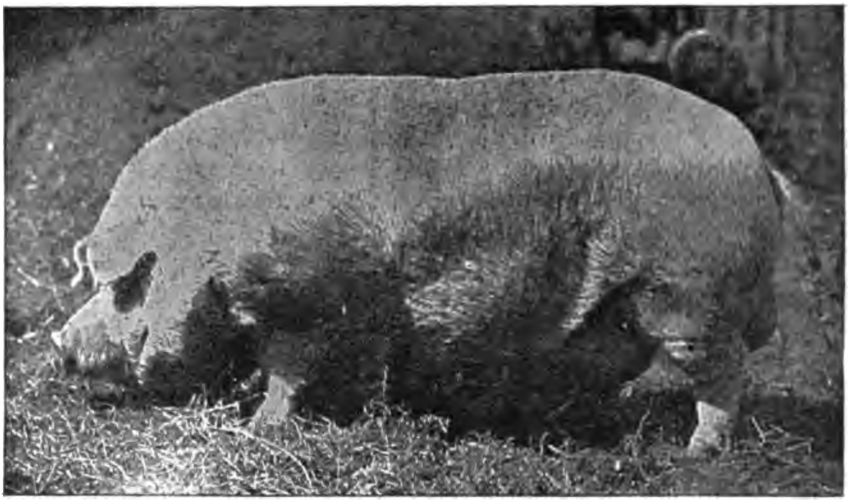

FIG. 51. CHESTER WHITE BOAR

GRAIN RATIONS FOR PIGS

The digestive system of the pig is relatively small. He lacks capacity for roughage when compared with the horse, the ox, or the sheep, but within his capacity coarse foods serve well to strengthen and develop his powers of consumption. Because of the nature and capacity of the digestive apparatus of the pig, he requires food that is concentrated and digestible, especially at the time of finishing. Small pigs cannot use to advantage large amounts of crude fiber. Their ration should be concentrated and digestible with a reasonable amount of bulk.

In the pork-producing regions of the United States, corn is the most common grain used to fatten hogs. Corn is low, however, in protein,

rich in carbohydrates and fats, but deficient in mineral matter. Experience has shown that corn alone is not the most economical feed for fattening pigs. It needs to be supplemented with feeds richer in protein and particularly in lime. It is therefore customary to combine corn with middlings, tankage, or skimmilk in proportions to insure continual development of the animals as to both growth and fattening. Corn alone will not give so large gains as when properly supplemented.

Corn may be fed as grain, or it may be "hogged down" by the animals in the field. As indicated earlier in this lesson, the New York farmer will probably be able to use corn to but a limited degree. Either the pigs will have to be finished on a substitute for corn, or they may be marketed before they are fully finished. A comparison of corn alone with corn and tankage and corn and buttermilk in the feeding of three different lots of pigs is given in table 4, compiled from results obtained by the Indiana Agricultural Experiment Station. Hogs on full feed of corn should gain about one pound per day and make about ten pounds of pork from a bushel of corn. If there is plenty of time for pigs to mature, it does not pay to grind corn. The inefficiency of corn or similar grains alone in putting gains on pigs is shown in table 4. The striking results when a small amount of tankage or buttermilk is used with the corn should be noted.

TABLE 4. COMPARISON OF CORN, TANKAGE, AND BUTTERMILK WHEN FED TO TEN PIGS IN A LOT FOR 70 DAYS*

	Corn alone	Corn and tankage	Corn and buttermilk
Average initial weight, pounds	79.00	79.50	78.50
Average final weight, pounds	99.00	173.50	206.50
Gain per pig, pounds	20.00	94.00	128.00
Pounds feed required per pound gain			
Corn	8.06	2.90	2.35
Tankage	....	.41	....
Buttermilk	....	....	6.94
Average daily gain, pounds	.29	1.34	1.83
Cost per 100 pounds gain	$8.64	$3.92	$4.08

* Cost of feed: corn, 56 cents per bushel; tankage, $50 per ton; buttermilk, 25 cents per 100 pounds.

Hominy feed is a fair substitute for cornmeal in the ration of fattening pigs. In a limited number of trials it required fourteen per cent less hominy feed than cornmeal for one hundred pounds of gain.

Barley is probably the next in importance of the carbonaceous feeds for swine. It is a highly esteemed feed for the production of bacon and should find a useful place among New York farmers in the ration for swine.

It is not palatable to swine and therefore should not be fed alone. It should always be ground or rolled and used with feeds rich in protein. In combination with middlings it lacks only about ten per cent in being equal to corn.

Wheat and wheat by-products in proper combinations are extremely valuable concentrates in the pig's ration. Whole wheat should be rolled or ground and is fully equal to corn in fattening pigs. Only under unusual economic conditions can one afford to feed wheat.

Coarse wheat bran is rather bulky, and it should not constitute more than ten per cent of the grain mixture. The use of the various grades of middlings and the low-grade flours is to be preferred. Wheat middlings are very popular as the nitrogenous supplement of pigs' rations. Ground limestone should be fed in conjunction with them to supply the deficiency in mineral matter. Experience has shown that the feeding of middlings alone is not most economical. They should be used with corn, tankage, skimmilk, and the like, to give best results.

Red-dog flour is an especially valuable feed for young pigs. It is highly palatable and digestible and has a low fiber content. In the pig's ration it produces generous gains.

Oats are a suitable feed for swine under certain conditions. For mature breeding stock and shotes, a limited amount of whole oats may be found useful. Usually oats should be ground for pigs. Ground oats are so bulky that they should not be fed alone to fattening pigs. They may constitute one-third of the grain ration during the early part of the feeding period, but toward the close they should be omitted. Oats and corn, and corn and skimmilk are good combinations, but oats and skimmilk is a poor combination.

In recent years, tankage has found an important place as a concentrated nitrogenous supplement in the finishing of fattening pigs. This is a meat meal well balanced in composition, with generous amounts of calcium and phosphorus. It is probably exceeded only by skimmilk and buttermilk in producing thrift and rapid gains. When high-grade tankage is used, that which has about fifty per cent of protein, not over ten per cent is needed to balance the ration. Less will suffice when animals have access to leguminous pasture or roughage. As pigs approach maturity, less tankage should be used. Rather young pigs may require as much as twenty per cent, tho part of this need may better be supplied with middlings and oilmeal. As with many other feeds, tankage gives best results when fed in conjunction with other concentrates, due to the beneficial effects following the use of proteids from a variety of sources. Tankage is a sterilized meat meal by-product that may be obtained from any agent of the large packing houses.

The oilmeals are worthy of mention tho their place in pig feeding is rather limited. For brood sows a small amount of linseed meal serves as a laxative. Large amounts required to balance a ration of corn may prove unpalatable to pigs. As a supplement to corn, oilmeal is slightly better than middlings and about one-half as good as tankage.

Cottonseed meal, except in very small amounts and for periods under forty days, is likely to prove fatal to pigs. The risks incident to its use are too great to justify placing it in the ration.

Cull peas and beans are frequently available on New York farms. These may be profitably used if fed with suitable carbonaceous grains. Either one fed alone will not give the best returns. Cull table beans are valuable for hogs when well cooked and given in connection with some starchy food. For growing pigs a mixture of two parts beans, two parts wheat middlings, and three parts cornmeal has been found satisfactory. The cost of cooking will need to be considered.

Rye alone is not an especially desirable hog feed, particularly for fattening. It should be ground or rolled and supplemented with a nitrogenous feed, such as tankage, middlings, or oilmeal. Rye meal ranks below corn but about equal to barley. Pork from rye in combination with other feeds is of satisfactory quality.

Some appropriate grains mixtures for swine under different conditions are indicated as follows:

WINTERING BROOD SOWS

6 cornmeal	6 cornmeal
3 middlings	4 middlings
1 tankage	skimmilk

SOW WITH PIGS

4 cornmeal	5 cornmeal
5 middlings	5 middlings
1 tankage	skimmilk

Young pigs after weaning should be fed chiefly skimmilk and middlings. Corn should be added slowly until the fattening ration is reached.

FATTENING PIGS

7 cornmeal	7 cornmeal
2 middlings	3 middlings
1 tankage	skimmilk

TABLE 5. FEEDING STANDARDS FOR SWINE

	Per day per 1000 pounds live weight			Nutritive ratio
	Dry matter (pounds)	Digestible protein (pounds)	Total digestible nutrients (pounds)	
Fattening pigs (weight in pounds)				
30– 50	46.2–51.0	7.8–8.5	41.0–45.4	4.0–4.5
50–100	37.0–40.8	5.5–6.0	32.9–36.4	5.0–5.6
100–150	32.4–35.8	4.4–4.9	28.9–31.9	5.5–6.2
150–200	29.0–32.0	3.5–3.9	25.8–28.5	6.2–7.0
200–250	25.5–28.1	3.0–3.4	22.7–25.0	6.5–7.3
250–300	22.4–24.8	2.6–2.9	20.0–22.0	6.7–7.5
Brood sows with pigs	20.0–24.0	2.4–2.7	18.0–21.0	6.0–7.0

FREE-CHOICE SYSTEM OF SWINE FEEDING

No discussion of the feeding of pigs would now be complete without reference to the free-choice system. Many feel that this system, which

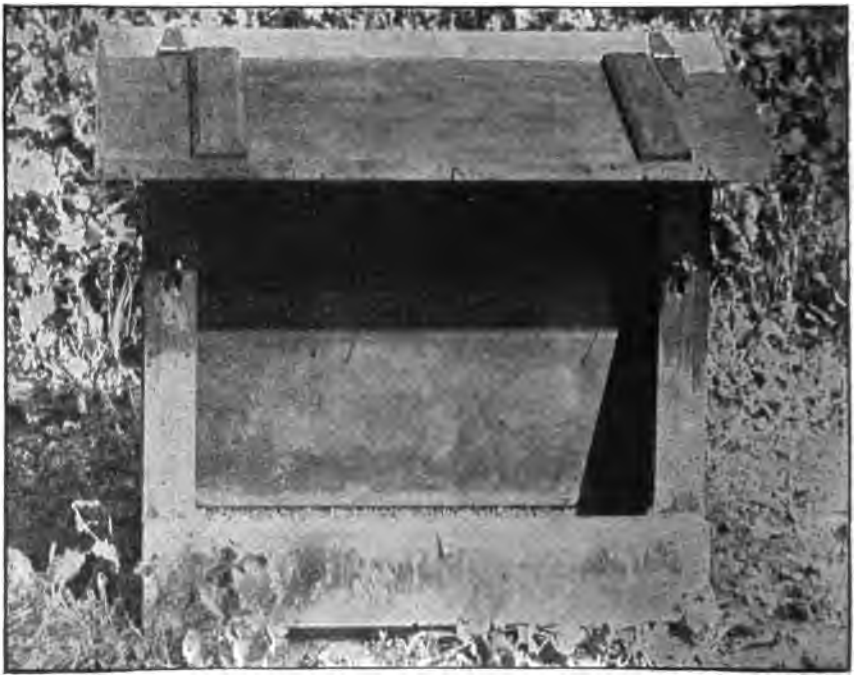

FIG 52. FREE-CHOICE FEEDER, SIDE VIEW

is rapidly gaining ground in other States, marks a new epoch in the feeding of hogs for market purposes. Whether it should be generally adopted in New York, where grain feeding must necessarily be limited, remains to be determined. The principles involved in such a plan are not new, but they are worthy of study now as a means of avoiding labor.

FIG. 53 FREE-CHOICE FEEDER, END VIEW

The animal with an unperverted appetite has instinctive ability, if given the opportunity, to select his feeds in such amounts and proportions as to supply himself with essentially a balanced ration. The plan is almost too simple for definition. The pigs have an opportunity of feeding themselves at any time or all the time. They mix their own feed and are responsible for the balance of their own rations. "A self-feeder for shelled corn, concentrates, and condimental or mineral food, in separate compartments is placed in the dry lot or small enclosure, which may also contain green rape, alfalfa, bluegrass, or timothy, and whenever the tenants crave any of the materials or any combination of them they are free to make their own choice, and to eat as little or as much as they want." Many comparisons between free-choice and hand feeding on the basis of cost of gain, rapidity, amount of gain, and profit are in favor of the former. It is essentially a system for fattening in a dry lot at a stage when the appetite of the pig may be depended on to guide him safely.

There is serious question as to the value of such a system for the rearing of breeding stock. The development of proper size and bone and the prevention of overfatness call for more control than a breeder would care to entrust to a free-choice system. It could be used in part, however, with good results in conjunction with green forage crops. Bone-building concentrates should be provided and change made to hand feeding before the pigs become too fat.

Self-feeders may be constructed by any farmer who wishes to try the plan, at an expense of from $6 to $10. There are various patented automatic feeders on the market, but the homemade kind will give as large net returns.

One feeder with experience says: "In one compartment put corn or ground barley, in another middlings, in a third a half and half mixture of tankage and linseed oilmeal, and in a fourth the mineral or condimental mixture as follows: one bushel wood ashes, one bushel ground charcoal, ten pounds common salt, five pounds sulphur, two pounds copperas and one pound ground limestone." He states that he has found that tankage is the most economical protein concentrate with which to balance barley or corn but that the addition of middlings and oilmeal to the ration gives slightly increased gains.

POINTS ON BREEDING

This lesson is not designed to cover at all completely the subject of swine breeding, further than to indicate the type in demand and how to obtain it. Generally speaking, there are two types of hogs, the lard type and the bacon type. The former is more universal, the latter being adapted only to special conditions of production and marketing. As the bacon breeds are less common and do not generally bring a premium on the market, farmers in this State naturally turn to the lard type for early maturity, desired conformation, and weight at an early age. An active type of hog must be selected to make full use of pastures and forage crops.

The breeds of the lard type that meet these requirements are Poland-China, Berkshire, Duroc-Jersey, Hampshire, and Chester White. Among the breeds of the bacon type are the Yorkshire and the Tamworth. The Hampshire and the Cheshire are sometimes classified as of bacon type. They are good grazers and for this special purpose mature as quickly as other breeds.

Utility must not be overlooked; hence one should question himself closely as to why he is breeding the animals he has chosen. Success lies in producing the type of market hog in demand. This has been interpreted to mean the animal that will give the largest proportion of valuable

meat, make rapid and cheap gains, and that will reproduce in profitable numbers. The requirements of both the feeder and the butcher must be considered. While a few breeders will readily turn their attention to pedigreed or registered hogs, the mass of farmers intent on utility stock are likely to feel satisfied with grades or crossbreds. The high fecundity and rapid succession of litters with sows are strong arguments for breeding nothing but purely bred swine. In the slower-breeding sorts of domestic animals a deliberate process of grading-up is probably to be recommended. With swine, there is small excuse to avoid purely bred stock, for the

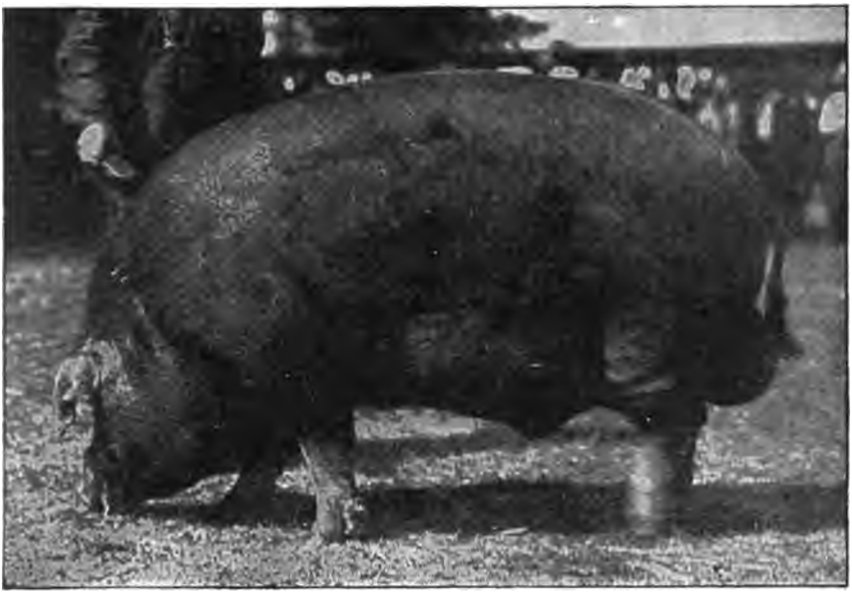

FIG. 54. DUROC-JERSEY BOAR

rapidity of increase soon reduces the initial cost to a small amount per animal. Animals of high utility spring from matings of types that meet the market need. Mating of extreme types should be avoided. Roomy, growthy females that are not coarse, should be used, for they are likely to be good and prolific mothers.

THE BOAR

Too much care cannot be given to the selection of the boar. Purebred males are now plentiful, and in view of their superiority their use should be universal. The use of a grade boar should not be permitted under any circumstances, as a purebred transmits his superior qualities with greater certainty and more uniformity.

Price should not be the first consideration in selecting a boar. Extreme investments are not necessary, tho a good sire is worth a substantial price. This is due to the fact that he is able to put superior growth and fattening qualities into his offspring. No person can get far in the swine business who fails to realize the value of such qualities and who is not willing to pay for them. The extra cost of a good boar as distinguished from that of a common one soon disappears when distributed to the whole pig crop.

In addition to price, judgment and experience should have full weight in selecting the boar. The old and tried boar should not be overlooked. Like aged sires in other classes of stock, they are sometimes unjustly discriminated against.

The first requirement of the boar is health and evidences of constitutional vigor. Having made sure of the general type of fat hog or bacon hog as the case may be and the breed characteristics to which he belongs, the next things to look for are bold carriage and masculinity. Coarseness and roughness are not desirable, but they are less objectionable than a lack of masculine qualities.

SELECTION AND CARE OF THE SOW

Often the hogs kept by farmers in New York State are of nondescript breeding and of inferior type. The number of breeders of purebred swine is increasing, as is the percentage of hogs with better blood, tho the actual progress made is not so rapid as it should be. The use of high-class boars on sows of approved type should be vigorously practiced. In so far as possible the sows retained for mothers should be carefully selected to hasten the fixation of the more desirable traits of type, quick maturity, and fecundity.

The sow should show capacity with refinement and possess size without coarseness. Her mammary development should afford twelve active teats. She should be strong in the feet, the back, and the legs, and should be able to carry herself well at all times. The profitable sow must be a good mother, produce large litters of uniformly good-sized pigs, and have a plentiful supply of milk for their early nourishment. If she is properly started when the pigs arrive, much anxiety and loss may be avoided.

It is important that the sow should have every attention at farrowing time, as it is worth all the effort it takes. The difference between an average of two or six to eight pigs to the litter is often made by giving intelligent attention when needed. The cost of each pig at birth is exorbitant if the sow raises only twins; it is three times as great as if a half dozen were raised. Profits or losses in the hog business are fre-

quently determined at this time. The task of raising pigs loses its interest when there is certain knowledge that the initial cost is so high as to eliminate all chance of profit.

A week or so before the sow is due to farrow, she should be removed from the other hogs and given quarters by herself. She should have a laxative ration tho not in too generous amounts. A good grain mixture for this time is composed as follows: 40 per cent corn, 35 per cent middlings, 15 per cent bran, and 10 per cent oilmeal, by weight. As the farrowing date approaches, the ration should be reduced somewhat. The need for cooling laxative foods is imperative at this period.

The pen for a farrowing sow should not have too much bedding. A bushel of chaff or cut straw, if the place is dry, will be sufficient and less dangerous to the pigs than large amounts of bedding. The sow should not be disturbed unless assistance is needed; if aid is necessary, it should be rendered in the most quiet manner possible.

Newly born pigs should not be allowed to become chilled before they are dry. If the sow is gentle, the pigs should be taken away as fast as they are farrowed if the weather is cold, and placed in a box or a barrel with hot bricks and blankets or other artificial heat. When the pigs become lively and dry, they may be returned to the sow. If the pigs are badly chilled, they may be revived by immersing them in hot water.

The sow's milk flow should not be stimulated for a few days. She should be fed very lightly, and given warm water if the weather is cold. It is not necessary to feed her for a day or two, and the first feed should be a thin slop. Her feed should be gradually increased as the pigs develop, until in two weeks' time she should be on full feed, consisting of a good laxative milk-producing ration. The best gains on pigs are made thru the mother, and she should be fed accordingly.

Some sows raise many pigs; others raise few. The size of the litter depends mainly on the sow. After her first litter the performance of the sow should be carefully noted in making selection of those to be retained. The sow that milks freely and forces six or eight pigs along at a rapid pace, even tho she may be rather thin after two months of nursing, is the one to keep. Rigid selection on this basis, not ignoring form, will rapidly advance the swine business. Brood sows from small litters should not be kept. It is a simple matter to mark the sow pigs from desirable large litters to serve if needed as future mothers. Sows should be at least a year old before producing the first litter. Mature sows produce ten per cent more pigs and twenty per cent heavier pigs than those bred too young. Usually inbreeding and immature boars should be avoided.

The period of gestation in sows is about 112 days. They vary somewhat in this particular, young sows being likely to farrow a few days sooner, while old sows frequently go a few days over this period.

The age of first breeding the sow is important. Most good breeders prefer not to breed the sow before she is eight to twelve months old. In all livestock, too early breeding is likely to reduce size. A very young sow is seldom able to raise a fair-sized litter and properly continue her own development. Another objection is that a small litter fails to properly develop the mammary glands, so that she rarely makes a good nurse with subsequent litters. An underdeveloped sow will not retain her usefulness over a long period, nor are her pigs likely to be strong and vigorous.

After the pigs are weaned, a mature sow may be bred again if not too much reduced by nursing. If she is thin and emaciated, immediate breeding will result in a small litter. Young sows with their first litters should usually not be bred to farrow again the same year. The breeding sow need not be fat, but should have three or four weeks of liberal feeding in order to insure a normal litter of large, vigorous pigs. With great care two litters may be produced each year, provided the animal does not have to be fitted for show. The sow's feed should be reduced when the pigs are being weaned.

CASTRATION

Boar pigs not intended for breeding purposes should be castrated before weaning. With care, however, it may be done later. The best time is when the pig is from four to six weeks of age. If the operation is performed at this time, the pig is still easily handled and the consequences are not serious.

The pigs to be castrated should be put into a clean pen to facilitate catching and to lessen excitement. There should be another clean pen to receive them after the operation. Dust, dirty litter, or mudholes should be avoided. A sharp knife is essential, and a three-per-cent solution of standard disinfectant is recommended. The knife, the hands of the operator, and also the parts of the pig concerned, should be washed with the disinfectant before the incision is made. Some breeders recommend an application of pine tar in hot weather to keep flies and insects from the wound. Accidents in such cases are rare, but care is always desirable.

THE YOUNG PIG AFTER WEANING

Opinions differ as to the best age at which to wean pigs. Weaning at six weeks is seldom advisable unless the pigs are well grown and are accustomed to their new feed. If the pigs are left on the sow too long, two litters cannot be had the same year. If still thriving, they should be left on the sow as long as circumstances permit.

Nothing equals skimmilk and middlings for young pigs after weaning. Soaking or scalding middlings may tend to prevent digestive troubles

and makes it better relished in the absence of skimmilk. Young pigs should be fed four times a day at first, and later three times.

Day says:[2]

. . . . . When pigs are about three months old, a little corn or other grain may be introduced into their ration. Two parts of middlings and one part of corn meal or ground barley, mixed with skim-milk to form a slop, make an excellent ration for growing pigs. As the pigs grow older the proportion of grain to middlings may be increased, but at no time should they be fed exclusively or almost exclusively upon corn, because corn is a poor bone- and muscle-former. . . . . .

The aim should be to develop bone and muscle during the early stages of growth, and, while the pigs should be thrifty and sleek in the hair, they should not be fed in such a way as to overload them with fat. This is especially true of pigs which are intended for breeding purposes, and which should be carried right through to breeding age upon feeds which stimulate growth and general vigor rather than fat. . . . . Variety in feeds and plenty of exercise are very essential features in raising an animal that will possess all-round development.

FIG. 55. DUROC-JERSEY SOW

HOUSING

A complete discussion of housing swine is not possible in this lesson. Conditions vary on farms, and the piggery in any case must be adapted to the needs. Any system of housing calls for light, ventilation, dryness, reasonable warmth, and convenience of arrangement. There are two general systems of housing swine, the colony system and the centralized piggery. If the number of sows to be kept is small, the colony system is adequate. If the business is extensive, some prefer the centralized plan.

In the colony plan the houses are inexpensive and of the shed roof or A type. They are about eight feet square on the ground and will

[2] Productive swine husbandry. G. E. Day.

accommodate a sow and litter until weaning, when they may be used to house the litter. In winter they may be used for a number of brood sows if properly bedded and well protected. The advantages of this plan are cheapness, sanitation, and facilities for exercise. Being portable, the houses may be shifted about to suit convenience. The disadvantages lie in increased labor in caring for the animals, extra labor in feeding, and general temptation to neglect the work.

The centralized piggery system is common on the larger farms, especially on breeding establishments, where two litters of pigs are expected each year. It is more permanent than the colony system and provides means for the best care thruout the year. The animals are all housed under one roof with pens facing on outside yards. This system has the advantage of ease in doing the work and encourages care in every way. The obvious disadvantages of the centralized house on the average farm are the large investment, the danger of extending disease, the difficulty of compelling exercise, and the lack of adaptation to pasturing conditions.

The average farmer wants a system of housing that is first inexpensive and with all adapted to a pasture and forage plan of feeding. Therefore some plan of colony-house arrangement is best for the larger part of the year. In regions of extreme cold a permanent warm enclosure for brood sows is recommended.

HEALTH

The hog is both susceptible to disease and difficult to treat when once attacked. Undue confinement and filthy conditions soon break down his resistance, and disease once established sweeps thru the herd with alarming rapidity. Dry, clean sleeping quarters, tight floors, and adequate drainage are essential to success with swine. Pens should be cleaned frequently, portable houses moved at intervals, and systematic disinfection practiced.

At least once a year the pig houses and pens should have a good cleaning. All bedding and manure should be removed, all walls and floors sprayed or washed with a standard disinfectant solution. A mixture of 5 parts of carbolic acid to 100 parts of water is recommended. Five or six ounces of chloride of lime to a gallon of water makes an effective disinfectant. A pint of carbolic acid with three gallons of whitewash applied to the walls and other parts of the houses, will do much to improve appearances and insure health.

In case of a serious outbreak of disease a quarantine should be established, and the case brought to the attention of a competent veterinarian. The losses in this country from hog cholera and allied diseases are too great to justify halfway measures.

Hogs are likely to be lousy, especially if housed. Lice are a drain on the hog's vitality and should be destroyed. Dipping, spraying, and

washing with a two-per-cent solution of a good dip will prove effective. With a small number of animals, washing or spraying may serve the purpose; but if a considerable number are to be treated for lice, they should be put thru a dipping vat. Dipping all over is the most effective treatment. The tank should contain lukewarm water to which the disinfectant dip has been added. The pig should work his way thru the tank with his nose out. A second treatment about a week after the first one should be given. This latter application reaches the lice not previously hatched and ensures a clean, comfortable animal ready to respond in the largest measure to feed and good care.

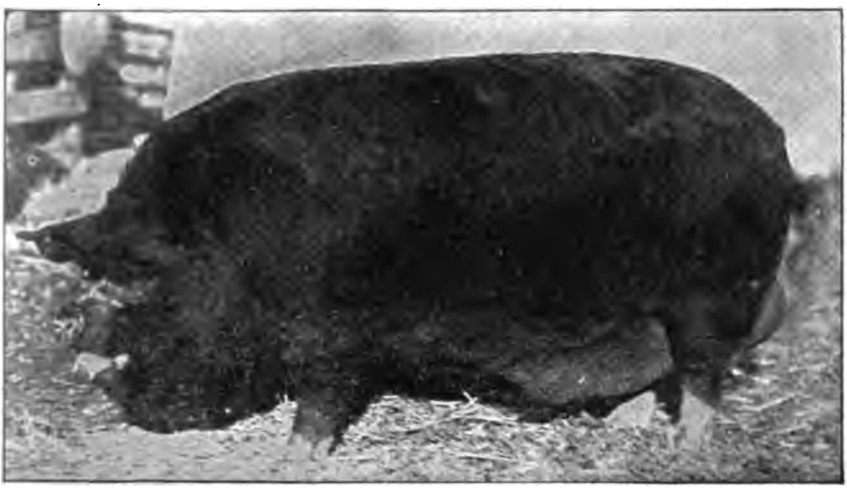

FIG. 56. BERKSHIRE BOAR

A PLAN FOR HOG RAISING

The best interests of hog raising in the East will be served by a plan that thru the minimum use of concentrates ensures cheap and rapid gains with the least labor. Pigs develop rapidly on natural forage crops if the needed nitrogenous supplements and the opportunity for activity are provided. It has been shown that the feeding of corn or any one concentrate alone is not profitable. There should be balance, variety, and the like, for quick gains. "The three elements in the ration of a growing pig that are more important than all others are protein, succulence, and exercise." After a certain weight is attained, additional gains are obtained at greater cost per pound. It is therefore probably not advisable to try to produce a greater weight than two hundred to two hundred and twenty-five pounds.

It cannot be emphasized too strongly that the cost of pork is reduced materially by the use of pasture and forage crops. To these crops for young and growing pigs and for finishing, some grain should be added. Hog raisers vary widely in the amount of grain fed, which naturally should vary according to the quality of forage available. The amount of grain used is determined largely by its cost. Some feed a ration equal to two to three per cent of the live weight of the pig, while others do not exceed a one-per-cent allowance.

Forage and pasture crops have a variable composition. Alfalfa, clover, vetch, and peas furnish feed richer in protein than most other crops. On such crops, pigs require less concentrates than when grazing non-leguminous pasture, such as timothy, bluegrass, or orchard grass. In early stages of growth the cereals are highly valuable. A plan that will provide in succession all the benefits of these crops thruout the growing season, should be worked out on every farm where pigs in any number are to be fed. Some of the advantages in "hogging off" crops are: (1) the cost of harvesting and marketing is reduced; (2) the labor of care is greatly reduced; (3) vegetable matter is added to the soil; (4) manure is distributed evenly and cheaply; (5) hogs get needed exercise. Pigs on pasture should be ringed and not allowed the run of too large an area at a time.

Crops are "hogged down" in two general ways: (1) by subdividing the area with movable fences into small divisions that will last the pigs ten to twenty days; (2) by turning the pigs directly into the whole field when the crop is ready. The former admits of greater control, tho the latter is more generally practiced. The number of hogs that can be pastured per acre depends on the richness of the soil, the season, the management of the hogs, the size of the hogs, and the kind and quality of other feeds used. The leguminous crops and rape will during their period of growth support eight to fifteen hogs per acre, the cereals and the grasses nine to twelve hogs per acre.

The following plan is offered as a rough suggestion covering the principles involved in obtaining a succession of forage crops. Five adjoining fields should be fenced making them any size — one acre or larger — depending on the number of hogs to be raised. Field 1 should be planted to alfalfa or clover, or clover and vetch. Field 2 should be seeded to rye the fall previous for early spring feed. Field 3 should be plowed early and planted to peas and oats. As soon as the ground is fit, field 4 should be seeded to rape, and later field 5 should be planted to flint or sweet corn, with rape or rye added at the last cultivation. Late in the summer, field 3 may be seeded to rye and in the following spring to clover to succeed field 2, and field 4 should be planted the spring following to peas and oats. Field 5 may be used for rape in the succeeding year.

A satisfactory hog pasture may be prepared by sowing together oats, peas, and sweet clover, using about twenty pounds of the latter seed per acre. Lime should be applied if the soil is deficient in that respect, and the sweet clover seed should be scarified and inoculated. Pasture will be furnished in the early part of the season by the oats and the peas and in the latter part by the sweet clover. The sweet clover will live thru the winter and furnish much feed the following summer. This plan suggests a seasonal succession of forage crops and indicates the general order of rotation.

A four-years rotation recommended is as follows: first year, rye seeded with sweet clover in the fall, and red clover and alsike clover in the spring; second year, clover pasture; third year, corn planted with soybeans, with rape sown at the last cultivation; fourth year, peas and oats or rape in successive plantings to be fed off with hurdles. A corn plot for finishing the pigs will be found an advantage.

Six to eight pounds of red clover, and eight to twenty pounds of sweet clover should be used to the acre. Rape or flat turnips may easily be sown in corn at the last cultivation, for grazing during the fall. In such cases two to four pounds of seed per acre will suffice.

CORNELL STUDY CLUBS

In a number of communities, groups have organized for the discussion and study of common problems, and have adopted the name of Cornell Study Clubs because of the use that they make of the Cornell reading course lessons to provide material for educational programs. Often a helpful reading course lesson will reach a farm home at a time when it cannot be given attention, and it is set aside and possibly forgotten. If, however, a special time is reserved for the study of reading course lessons at a club, it is likely that much helpful reading will be accomplished. It is a pleasure to discuss with others the common problems of work on the farm and in the home, and social as well as educational advantages should result from meeting together. The membership of Cornell study clubs may be composed of farm men and farm women, and separate discussions on agriculture and home problems may be held in different rooms of a common meeting place. Usually the men and women hold the opening numbers of the program together, and join in a social hour after the group discussions. If preferred, separate clubs of men and women may be formed.

The program should be carefully planned at least several weeks in advance. Some of the clubs prepare printed programs of all the meetings for the year. The opening numbers of the program may include readings, recitations, and music, in addition to the transaction of business. The group discussions should be in charge of a leader selected well in advance. After the group discussions, the clubs usually enjoy singing and games, and often refreshments are added. The reading course lessons should be obtained by the secretary of the group and distributed one meeting in advance so that the members may be prepared to take part in a general discussion to follow the leader's talk or reading. A question box is a useful addition to the program. Questions may be answered from local experience, or referred to the College of Agriculture. At the meetings of some clubs lists of articles for sale or for exchange are read, together with lists of articles wanted. By promoting local exchanges and sales of farm products, implements, stock, and the like, and by collective buying and selling, it may be found possible for the club to serve the business interests of the community.

The success of a Cornell study club depends principally on the development of local leadership. Assistance is given in organizing and conducting clubs, and speakers are sent to clubs occasionally in connection with the regular extension work of the College. Further information concerning organization, objects to be attained, and the preparation of programs will be sent on application to the Supervisor of the Reading Course for the Farm, College of Agriculture, Ithaca, New York.

THE CORNELL READING COURSE FOR THE FARM

Residents of New York State may register without charge for one or more of the following series in the reading course. Each of the reading course lessons is available for distribution on request.

THE SOIL
74 Introduction to the principles of soil fertility
42 Tilth and tillage of the soil
70 Soil moisture and crop production
78 Land drainage and soil efficiency
50 Nature, effects, and maintenance of humus in the soil
127 Farm manure: its production, conservation, and use

FARM CROPS
66 Meadows in New York
90 Alfalfa for New York
110 Buckwheat
124 Field bean production
108 Culture of sweet clover and vetch

LIVESTOCK
137 The dairy herd
114 Silos, and the production and feeding of silage
131 Contagious abortion of cattle
136 The beef breeding herd in New York State
119 The curing of meat and meat products on the farm
134 Starting a flock of sheep
115 Keeping sheep for profit
139 Swine production in New York

DAIRYING
86 The production of clean milk
102 Cooling milk
82 Cream separation
32 Composition of milk and some of its products
60 Farm butter-making
98 Practical examples in dairy arithmetic
118 The Babcock test, and testing problems
135 The farm ice supply

FRUIT GROWING
125 Orchard soil management
104 Pruning
84 Insects injurious to the fruit of the apple
123 Top-working and bridge-grafting fruit trees
72 Culture of the grape
36 Culture of red and black raspberries and of purple-cane varieties
52 Culture of the blackberry

THE HORSE

56 Practical horse breeding
113 Judging draft horses

POULTRY

130 Rearing chickens: Brooder house construction
133 Preparation of eggs for market

VEGETABLE GARDENING

120 Hotbeds and cold frames
122 Planting the home vegetable garden
92 Summer care of the home vegetable garden
132 Drying fruits and vegetables in New York State

FLOWER GROWING

106 Spring in the flower garden
128 Autumn in the flower garden
121 The culture of garden roses

BEEKEEPING

138 Beginnings in beekeeping

PLANT BREEDING

38 Principles and methods of plant breeding
129 Improving the corn crop by selection and breeding

FARM FORESTRY

12 The improvement of the woodlot
62 Methods of determining the value of timber in the farm woodlot
40 County, town, and village forests

COUNTRY LIFE

64 The rural school and the community
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THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 139 | LIVESTOCK SERIES | NOVEMBER, 1918

SWINE PRODUCTION IN NEW YORK

DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

The available reading course lessons for the farm are arranged in series on the following subjects: THE SOIL, FARM CROPS, LIVESTOCK, DAIRYING, FRUIT GROWING, THE HORSE, POULTRY, VEGETABLE GARDENING, FLOWER GROWING, BEEKEEPING, PLANT BREEDING, FARM FORESTRY, COUNTRY LIFE. New readers may enroll in one or more of these subjects. The first lesson in the series is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. The reader may register for the Livestock Series by signing and returning this discussion paper. The space below on this page is reserved for registration in other series, and also for names and addresses of residents of New York State likely to become interested in the reading course.

(Detach, sign, and return for the next lesson in this series.)

(In answering questions, attach additional paper if needed and number the answers.)

1. What are the conditions in New York State that make it possible to produce a limited amount of pork profitably?

2. What economic conditions make it difficult for a New York farmer to compete with a farmer in the Corn Belt in pork production?

3. What is your most valuable by-product used in pig feeding? What value do you attach to skimmilk or buttermilk when fed to growing pigs?

4. Have you ever had experience in feeding garbage or similar refuse to pigs? What results were obtained?

5. How many pigs do you fatten each year? Do you keep brood sows? Under what conditions should a farmer buy his pigs or raise them?

6. How do you handle your pigs in summer? Which is more desirable close yarding and grain feeding, or free range and forage crops? Give your experience.

7. Outline a satisfactory succession of green forage crops for swine, preferably from experience or observation.

8. What are the advantages of the colony plan of housing? the disadvantages?

9. What are the advantages of the centralized piggery? the disadvantages?

10. Have you had experience with the free-choice system of swine feeding? If so, give your opinion of its value.

11. Criticise the plan for hog raising on page 27 with reference to its application in your case.

12. Do you endeavor to produce your home supply of meat? What proportion is pork?

Name..

Address..

Date..

(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)

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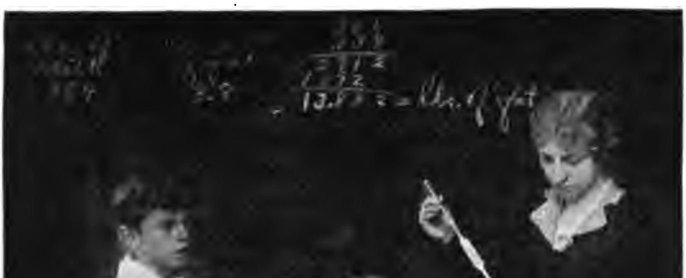
LESSON 140 DAIRYING SERIES DECEMBER, 1918

THE BABCOCK TEST, AND TESTING PROBLEMS

H. C. TROY



TESTING THE FARMERS' MILK AND TEACHING THEIR CHILDREN

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THE CORNELL READING COURSE FOR THE FARM

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ROYAL GILKEY

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BRISTOW ADAMS
RUTH VAN DEMAN

"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture."— ABRAHAM LINCOLN.

The progress of democracy depends ultimately upon the solution of human needs. Increased food production is the crying need of the world to-day. The next few years will call for the greatest skill in American agriculture. The combination of cultivated thought with labor increases efficiency in farming, which in turn means better profits and increased satisfaction in farm living.

The College of Agriculture, thru the Reading Course for the Farm, offers thirteen series of lessons for home study free to residents of New York State. The attached discussion paper gives details about these series. The reading course lessons are elementary and brief. Three advanced reading courses, in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods.

In a number of communities groups have been organized for the discussion and study of common problems, and have adopted the name Cornell Study Club. The primary purpose of a Cornell study club is to furnish an occasion and an incentive for discussing reading course lessons for the farm and for the farm home, but the objects include the accomplishment of local improvements, the encouraging of cooperative buying and selling, and the bringing of outside speakers into the community. Cornell study clubs are educational and social centers, and should develop local leadership and the human resources of the community. Assistance is given in organizing and conducting clubs, and speakers are sent to clubs occasionally in connection with the regular extension work of the College.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

THE BABCOCK TEST, AND TESTING PROBLEMS

H. C. Troy

Previous to 1890 practically all milk was bought and sold by weight or measure regardless of its composition. In that year Dr. S. M. Babcock invented the milk-fat test that bears his name. By the application of this test it has become generally known that the percentage of fat in milk from different herds often varies widely. This fact is important because fat is the most valuable milk constituent, and often forms the chief basis in fixing the price of milk. The farmer cannot now determine whether it will be more profitable to sell his milk by the hundredweight or on the milk-fat basis, unless he first tests the milk.

It is also necessary for the farmer to know the amount of milk produced by a cow and the percentage of fat her milk contains when he fixes her market value or attempts to improve his herd by removing the poorer cows and by replacing them with better ones. The farmer cannot intelligently select young stock for building up his herd unless he has the milk and fat records back of the dams and sires to direct him.

In this lesson, an attempt is made to give directions that will assist dairymen in determining the percentage of fat in milk and cream, and by practical problems (pages 151 to 156) to point out how they may determine which are the valuable cows in a herd or which method of marketing a dairy product will bring the larger returns. These directions are made as plain as possible in order to encourage their greater use.

A herd record sheet, a simple and convenient means for recording the weight and the percentage of fat of milk from each cow, is included in this lesson. It should be placed on the wall near the spring scales, and renewed each month. These record sheets should be carefully preserved for study when computing the profit or the loss of the business, or when attempting to improve the herd by removing the poorer cows and selecting calves from the better ones.

The Babcock test in rural schools can be of great service to the dairymen in the school district. It is not difficult for the farmer to learn how to test milk, nor does the operation require very much time; but under the pressure of other work testing may often be neglected. If each rural school were equipped with an outfit for testing milk and cream, the tests for the farmers in a school district could be made at the school, thus reducing the expenses very much because one set of testing apparatus would serve many dairymen. The teacher could instruct the older pupils to make the test and to assist in the work. They would quickly learn the best method of performing

each part of the operation and would gain confidence to continue the practice of testing their herds. The test can also be made the basis for problems in arithmetic that will quicken the pupils' interest when the application is so readily seen. The pupils will find real pleasure in making the test, and they will become interested in a useful work when comparing the milk and fat records of different cows and herds, and the methods of feeding and breeding that produce the best results.

A complete testing equipment for a rural school includes all the apparatus listed. The sampling apparatus is useful in showing dairymen what they should have. Or the school might first obtain the milk-testing outfit if it cannot afford the complete list, and the other apparatus can be added as the work progresses. The covered twelve-bottle tester should always be used where children are present, in preference to the open form of smaller machine, because there would be much less danger of accident.

FAT VARIATIONS IN MILK

The fat in milk commonly varies between three and six per cent. These variations come from several causes. One of the most important is the breed of the cows; another is the difference between individuals of the same breed. The percentage of fat in the milk of an individual in extreme cases may average either one per cent above or one per cent below the breed average. Also, the percentage of fat is affected by the length of time since the cow has freshened. It is a well-known fact that toward the end of the lactation period, when the cow is being dried off, the milk contains a higher percentage of fat than it did earlier in the season. It is also fairly well established that, when the time elapsing between milkings is not of equal length, the milk drawn after the longer period contains the lower percentage of fat. There are also minor influences affecting the fat content, such as a feverish condition of the animal, or overexcitement due to dogging or other ill treatment that might cause the cow to hold up part of her milk, thus giving a larger portion of the milk that is first let down, which is not so rich in fats as the strippings. The character of the food of an animal has very little effect on the percentage of fat in the milk, altho it has a marked effect on the amount of milk and fat produced.

FAT PERCENTAGE AND FOOD VALUE

When measured by energy units, the fat supplies about one-half of the food value of average milk, and the solids not fat furnish the other half. The solids not fat are composed of milk sugar (lactose), casein, albumin, and mineral matter (ash).

Recently it has been discovered that milk also contains two very important growth-promoting and health-regulating principles, one dis-

solved in the fat and the other dissolved in the remainder of the liquid. Several other foods contain these two principles, but man must depend very largely on milk or its products to supply his need for them. Thus while vegetable oils and such substances as oleomargarine may be valuable for supplying heat and energy, they cannot take the place of milk-fat or butter without probable danger to the health and full development of the individual.

The difference in the food values of equal quantities of milk containing different percentages of fat is shown in figure 57. A 1-per-cent increase in the percentage of fat in normal milk indicates about a 20-per-cent

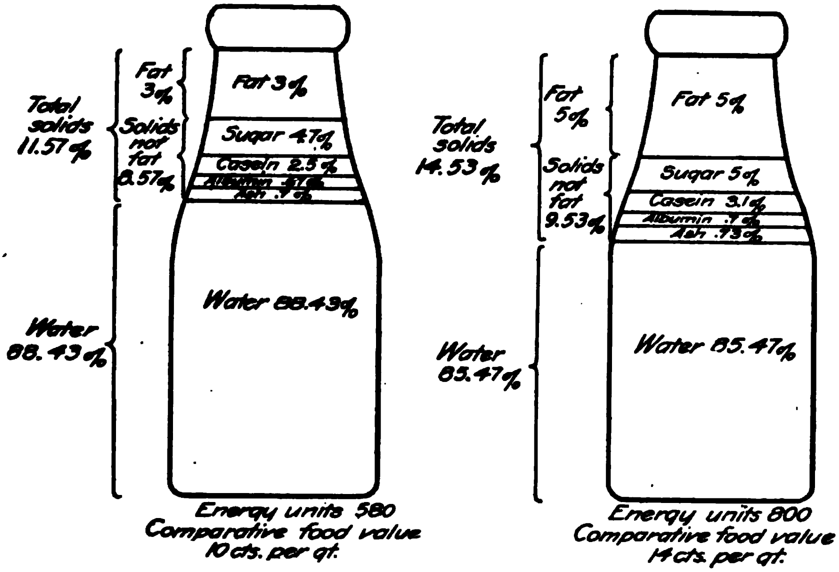

FIG. 57. COMPARISON OF AVERAGE COMPOSITION AND FOOD VALUE OF MILK CONTAINING THREE AND FIVE PER CENT OF FAT

increase in the food value. Thus when a quart of milk containing 3 per cent of fat is worth 10 cents, a quart containing 4 per cent is worth 12 cents, and a quart containing 5 per cent is worth 14 cents. These facts have not been generally understood in the past, and have not received sufficient attention in the retail marketing of milk. They point out the importance of the fat test.

One hundred pounds of milk containing 3 per cent of fat will make about 3.6 pounds of butter, while the same weight of milk containing 5 per cent of fat will make 6 pounds of butter (fig. 58). This shows the importance of testing milk when calculating its butter-making value. The increase in the number of pounds of butter over the number of pounds of fat in the milk or the cream is called the overrun, and it is due to the

water, the salt, and the casein that remain in the butter when the churning process is completed. One hundred pounds of butter of average composition contains about 82 pounds of fat, 14.5 pounds of water, 2.5 pounds of salt, and 1 pound of casein.

The percentage of fat in milk also indicates its cheese-making value. Thus while 100 pounds of milk containing 3 per cent of fat will make on an average about 8.3 pounds of cheese, the same amount of 4-per-cent milk will make 10.6 pounds, and a like amount of 5-per-cent milk will make 12.9 pounds.

Fat exists in milk in the form of very small globules. With the aid of a high-power microscope they may be seen floating in the liquid. Since

A B C

FIG. 58. AMOUNT OF BUTTER MADE FROM ONE HUNDRED POUNDS OF MILK CONTAINING VARIOUS PERCENTAGES OF FAT

A, one hundred pounds of milk containing 3 per cent of fat made 3.6 pounds of butter; B, one hundred pounds of milk containing 4 per cent of fat made 4.8 pounds of butter; C, one hundred pounds of milk containing 5 per cent of fat made 6.0 pounds of butter

the fat globules are lighter than the other milk constituents, most of them rise to the surface under the influence of the force of gravity. There, mixed with other milk substance, these globules form a layer of cream.

When sulfuric acid of proper strength and temperature is added to milk, as in the Babcock fat test, the casein, the milk sugar, and the albumin are decomposed, and the sticky quality of the milk is destroyed. The acid does not, however, decompose the fat, but leaves it free to come to the surface of the mixture under the influence of centrifugal force generated in the testing machine.

TESTING EQUIPMENT

The testing equipment that a dairyman should purchase may vary according to different circumstances. If the farmers in a neighborhood arrange to have their milk tested at a central point, such as a district school, then each would need to purchase only the sampling outfit, which would cost between three and four dollars. If they tested their milk at their homes, in addition to the sampling outfit each would need the milk-testing outfit and, for the accurate testing of cream, the additional cream-testing apparatus.

MILK-SAMPLING OUTFIT

Spring scales	$3.00
Record sheet	.05
Sampling dipper	.15
Six sample jars	.60
	$3.80

MILK-TESTING OUTFIT

2 pipettes with capacity of 17.6 c. c.	$0.40
12 Babcock milk test bottles	1.50
2 skimmed milk test bottles	1.00
2 acid measures with capacity of 17.5 c. c.	.25
1 twelve-bottle tester	12.00
1 tin cup with spout	.25
1 gallon of sulfuric acid	.75
	$16.15

ADDITIONAL APPARATUS FOR TESTING CREAM

4 cream test bottles	$1.00
1 cream scales	8.00
1 tin pail	.15
1 thermometer	.50
1 pint of meniscus remover (glymol)	.25
1 dropping pipette	.10
	$10.00
Total	$29.95

When ordering Babcock milk or cream test bottles or 17.6 cubic centimeter milk pipettes, the buyer should specify "Standard Babcock Glassware" that has been tested for accuracy and marked "S. B." at the New York State Agricultural Experiment Station, Geneva, New York.

MILK-SAMPLING OUTFIT

In the sampling outfit, bottles holding from four to eight ounces, or from one-fourth to one-half pint, could be substituted for the sample jars. The wide neck of the latter, however, permits the milk to be added quickly without danger of loss and also enables the operator to observe the condition of the sample and to clean the jar more readily. The jar should be labeled with the name or the number of the cow producing the milk sample. The sampling dipper should hold an ounce and should have a wire handle about a foot long. A spring scales, permanently suspended near the location of the receiving cans, affords the simplest method of weighing the milk. A convenient arrangement of the sampling apparatus is shown in figure 69 (p. 153).

If it is impossible to afford a spring scales, the weight of the milk may be calculated. To do this, first accurately measure the milk, then multiply the number of quarts by 2.15, as one quart of average milk weighs about 2.15 pounds. Thus if a cow yields 7.25 quarts at a milking, the weight of the milk would be approximately 15.58 pounds. $7.25 \times 2.15 = 15.58 +$.

MILK-TESTING OUTFIT

The number of test bottles that should be ordered with the testing outfit depends on the amount of testing to be done. Usually two test bottles are allowed for each cow in the herd. Two each of pipettes, acid measures, and acid bottles would be sufficient. Then if one were broken, another would be ready for use. Where hand power is used, the covered form of twelve-bottle hand tester is safer than the four-bottle machine. It also may be kept at a proper temperature with less difficulty than the smaller machine. The four-bottle tester might serve where only one or two cows are to be tested, and it would cost complete only six or seven dollars.

Sulfuric acid may be bought at almost any drug store. The buyer should state that the acid is to be used in the Babcock test and that it should be of such concentration that it will have a specific gravity between 1.82 and 1.83. The acid should be kept in glass-stoppered jugs or bottles; otherwise it will absorb moisture from the air and become too weak to dissolve the milk solids and free the fat. Acid that is too strong might burn the fat. Sulfuric acid is a strong poison, and if it happens to come in contact with the flesh or the clothing, should be removed at once by

FIG. 59. MILK-TESTING OUTFIT

washing with large quantities of cold water. Bicarbonate of soda (common baking soda), ammonia, or a similar alkaline substance should be applied to remove any acid not washed away.

CREAM-TESTING APPARATUS

There are several forms and sizes of cream test bottles. The six-inch nine-gram bottles are preferable especially for use in hand testers. This form of bottle has a scale graduated to read from 0 to 50 per cent, the smallest scale divisions equaling .5 of 1 per cent.

The balance for weighing cream test samples should be sensitive to .1 of a gram. A form of balance should be bought that may also be used for general weighing purposes, especially if it is for use in a school. There it may be used in many instructive experiments that will interest the pupils and form the basis of problems in arithmetic. A good form of druggist's dispensing balance with a set of weights in grams would serve well and would be the least expensive and most durable.

An ordinary four-quart pail would serve as a vat in which to bring the fat in the cream test bottle to the proper temperature before adding the meniscus remover and reading the test. The vat should be of such depth that when it is nearly full of water and the cream test bottles are placed upright in it, the upper surface of the water and of the fat columns will be on about the same level.

The thermometer should be of a form that registers each temperature degree between the freezing and boiling points of water. That would permit of its use for a variety of purposes.

The meniscus remover is made from a purified mineral oil that has been colored red with alkanet root. It is sometimes called glymol. When placed on the top of a fat column in a cream test bottle it flattens the curved surface, which is known as the meniscus.

TAKING TEST SAMPLES

The milk from each cow in a herd should be weighed and tested at regular intervals. A very good practice is to weigh and test the milk on the first, the tenth, and the twentieth of each month. Since there is likely to be a little difference in the percentage of fat in the night's and morning's milk, it is preferable each time to weigh and sample two successive milkings.

At milking time a pail of known weight may be hung on the scales and the milk from a cow poured into it and weighed. When several pails are used, it is convenient to make them all of equal weight by attaching solder to the bottoms of the lighter ones. Then when a cow is milked, the pail may be hung on the scales. The weight of each cow's milk should

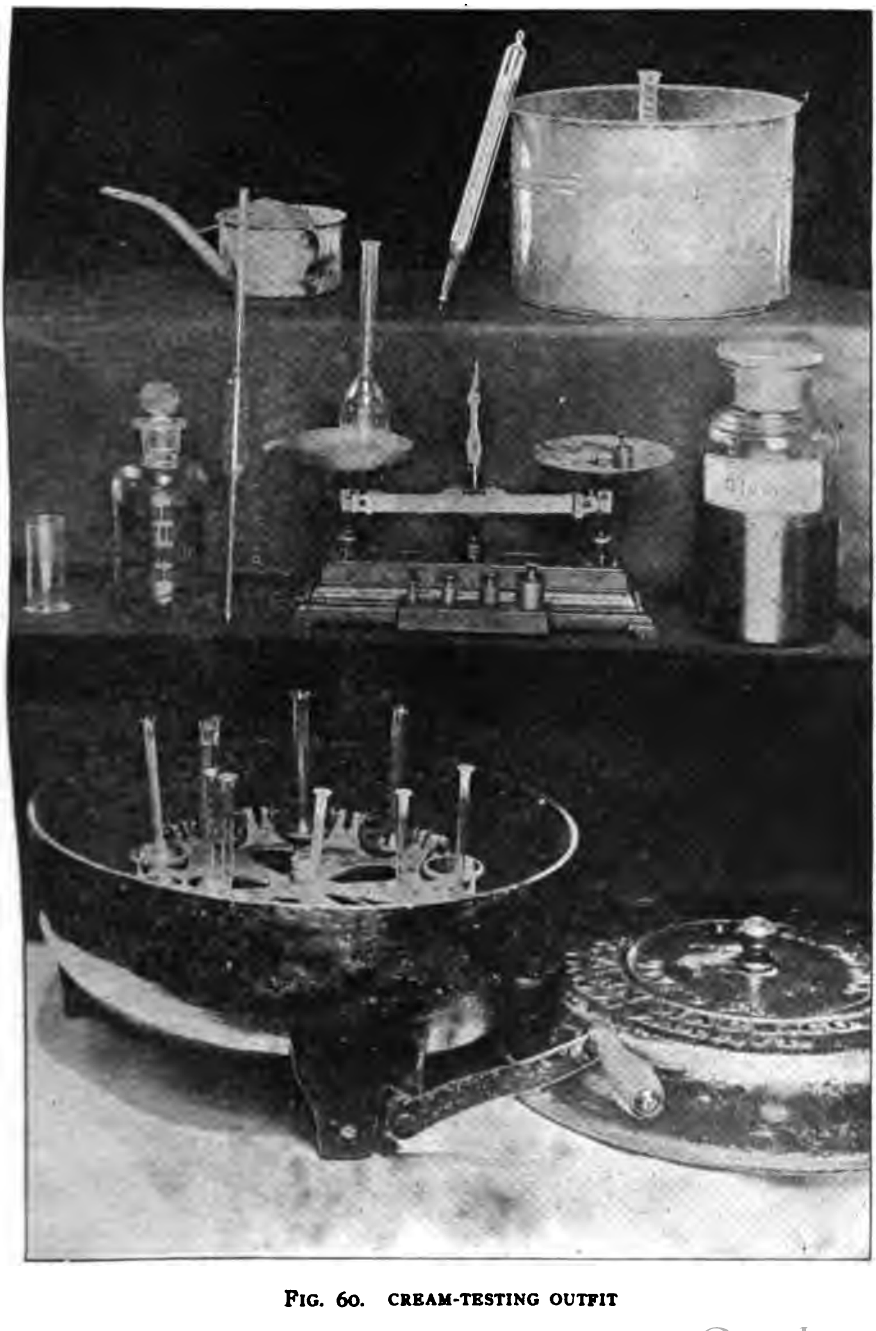

FIG. 60. CREAM-TESTING OUTFIT

be set down after the name or the number of the cow on the record sheet. The milk should then be mixed by pouring it from one pail to another or by thoro stirring. By use of the sampling dipper two ounces of the milk should immediately be placed in the sample jar. The jar should be stoppered and kept in a cool place until more milk is added or until the milk is tested. It would be well to first weigh and sample the night's milk; then a sample from the morning's milk taken in like manner could be added to it and the mixture tested. Or each sample could be held and tested separately.

FIG. 61. CORRECT POSITION OF THE PIPETTE AND TEST BOTTLE WHILE TRANSFERRING THE MILK

TESTING THE MILK

Mix the milk by pouring, allowing it to flow down the side of the vessels to avoid incorporating air bubbles. Vigorous shaking should be avoided. See that all cream is removed from the sides of the sample bottle and that it is evenly distributed thruout the milk. Then holding the pipette between the thumb and the second finger of the right hand, place its tip well under the surface and draw in the milk by suction with the lips on the upper end until it is filled well above the graduation. Quickly place the fleshy pad of the forefinger over the opening and at right angles to the pipette. By rolling the pipette a little between the thumb and the second finger sufficient air will enter to allow the milk to run out slowly until the upper surface is exactly level with the graduation. The pipette should be held perpendicular, with the graduation on a level with the eye.

Hold the milk test bottle in a slanting position and place the tip of the pipette into it about one-third of an inch and at a slight angle (fig. 61). Allow the milk to flow slowly down the side of the bottle neck, making certain that none is blown out by the escaping air. Blow the drop that remains at the tip of the pipette into the test bottle. Measure out

another test sample in the same manner, as the test must be made in duplicate.

ADDING THE ACID

Fill the measure to the mark with acid, and then rotate the test bottle slowly while adding the acid so that it will rinse down any milk remaining in the neck. Immediately mix the acid and the milk thoroly by whirling the body of the bottle in a circle five or six inches in diameter (fig. 62), using care to keep the mixture out of the neck of the bottle. Shake the mixture vigorously for about one minute after all curd has disappeared, and shake it again just before centrifuging to insure complete solution. Avoid pointing the neck of the bottle toward any person during the mixing operation, and so prevent the possibility of having acid thrown into the eyes or on the clothing. The acid unites with all of the milk substances except the fat, thus generating much heat. The temperature of the mixture usually rises to 225° F.

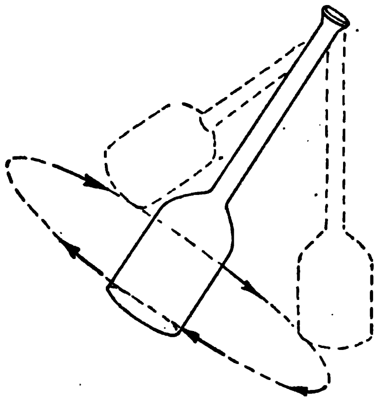

FIG. 62. DIAGRAM SHOWING THE MOTION AND POSITION OF A TEST BOTTLE WHILE MIXING THE MILK AND THE ACID

CENTRIFUGING THE BOTTLES

First heat the centrifuge either by placing it on a stove or by adding a few quarts of boiling water. A corked opening in the bottom provides a means of removing the water.

The disk of the machine must be balanced by placing test bottles in exactly opposite pockets. Cover the machine before turning the handle. About eighty revolutions of the handle per minute usually generate one thousand revolutions, the required speed of the disk. After whirling the bottles for five minutes, stop, and, without removing the bottles from the pockets, fill them nearly to the base of the neck with water that is nearly boiling hot. The pipette or a tin cup with a slender spout may be used for this purpose (fig. 63). Whirl the bottles again for two minutes in order to wash any sediment from the fat. Again add hot water to the test bottles until the top of the fat column is a little below the highest graduations on the scale. Whirl the bottles for one minute, and take the readings immediately. If the tests are not read immediately, they should be held at a temperature between 130° and 140° F. either by

keeping the centrifuge hot and covered or by placing the test bottles in water at that temperature and deep enough to surround the fat columns.

READING THE PERCENTAGE OF FAT

Subtract the reading on the scale at the base of the fat column from the reading at the highest point at the top of the fat column (fig. 64). The difference is the percentage of fat in the milk. Thus, if the scale at the base of the column reads 1.7 and at the top reads 5.8, then 5.8 minus 1.7 equals 4.1, the percentage of fat in the milk. The curved surface called the meniscus, which always exists at the top of the fat column, must be included in the reading, as it is just large enough to make up for a small amount of fat remaining down in the body of the bottle. The limit of error for the test is usually less than .2 of 1 per cent. When such a difference occurs in a duplicate test, the average of the duplicate readings should be taken.

FIG. 63. POURING THE HOT WATER INTO THE BOTTLES

SAMPLING CREAM

Cream differs from milk by containing a higher percentage of fat. Cream containing 30 per cent of fat would contain 70 per cent of skimmed milk substance, or milk serum. Before sampling, the fat should be evenly distributed by thoro mixing or pouring. If the cream is old or lumpy or some has dried on the container, it should be warmed to about 95° F. and the lumps should be passed thru a strainer before mixing. Then about two ounces should be placed in the sample bottle.

TESTING THE CREAM

The test sample must be weighed instead of measured because:

1. The percentage of fat and the specific gravity of cream vary widely, and the weight of a definite volume would vary accordingly.
2. Cream may contain bubbles of air or of carbon dioxide.
3. Cream varies so widely in viscosity (sticky quality) that the amount delivered or the amount remaining in the pipette would be unknown.

In testing cream 9 grams is used. Balance the bottle on the scales, and place a 9-gram weight on the opposite side. Mix the sample thoroly, and by means of a pipette transfer cream to the test bottle until the scales exactly balance. Next add about 9 cubic centimeters of water to the test bottle. This water may be measured with sufficient accuracy in the acid measure by filling it a little over halfway to the mark. Add about 15 cubic centimeters of the acid to the test bottle, and mix the contents thoroly. The cream and acid mixture should not turn black, but should remain coffee color. About 15 cubic centimeters of acid gives the proper concentration to dissolve the solids not fat, since the fat forms such a large part of the mixture and does not go into solution. Centrifuge the bottles, and add the water exactly as in testing whole milk.

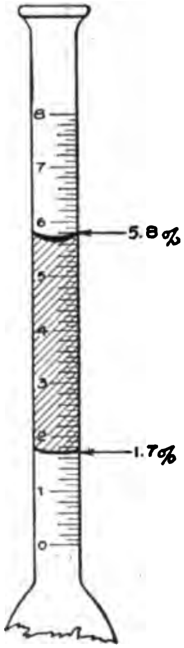

FIG. 64. METHOD OF READING THE PERCENTAGE OF FAT IN MILK

The arrows indicate the points on the scale at the ends of the fat column at which the readings should be taken

TEMPERING THE FAT AND READING THE PERCENTAGE

When the last whirling is completed, transfer the test bottles to the tempering vat containing water held at a temperature of 140° F. The water should be tempered in advance, and it should be deep enough to surround the necks of the bottles to the top of the fat columns. After four minutes take the bottles from the water, and add the meniscus remover at once by placing the tip of a dropping pipette containing some of the substance against the inside of the neck of the bottle, which is held in a slightly slanting position. The red liquid is allowed to run slowly down the inside of the neck and spread over the fat to a depth of about one-fourth of an inch. It should not mix with the fat. Read the test immediately by subtracting the number on the scale at the bottom of the fat column from the number on the scale at the line of division between the fat and the meniscus remover (fig. 65). Thus if the bottom line of the fat column reads 12 and the line between the meniscus remover and the fat at the top reads 39, the percentage of fat would be 27.

In testing milk the meniscus should be included in the reading as it is just sufficient to make up for the fat that is not brought up by the test. But the volume of the meniscus on the cream test is much larger than the one on the milk test, while the amount of impurities in the larger volume of fat in the cream test is about sufficient to make up for any fat remaining down in the bottle. Therefore, the meniscus on the cream test should be removed before reading the percentage of fat.

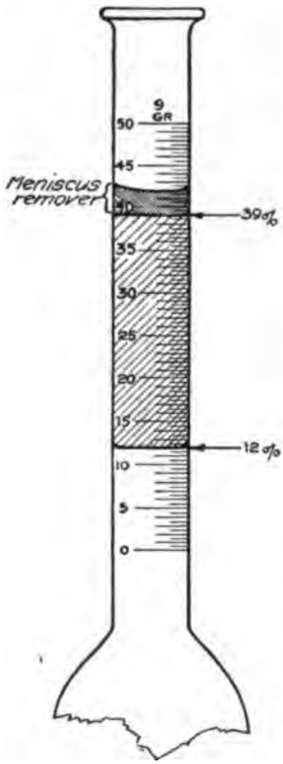

FIG. 65. METHOD OF READING THE PERCENTAGE OF FAT IN CREAM

The arrows indicate the points on the scale at the ends of the fat column at which the readings should be taken

APPEARANCE OF A COMPLETED TEST

In a completed test the fat should be straw-yellow in color; the ends of the fat column should be clearly and sharply defined; the fat should be free from specks and sediment; the water in the neck just below the fat should be clear; and the fat should be in the graduated part of the neck. Some of the defects and remedies are explained in the following paragraphs.

If the fat column is too dark in color, the acid may have been too strong, or too much may have been used, or the temperature of the milk and the acid may have been too high just before mixing. Mixing too slowly might also permit charring of part of the fat. The charred or darkened condition of the fat may be corrected to some extent by using less acid, by cooling both milk and acid below 60° F. just before mixing, and by rapid, vigorous mixing continued for about a minute after all casein has been dissolved.

If the fat column is too light in color, the acid was either too weak or too cold. This condition may be corrected to some extent in succeeding tests by using more acid and by having the milk and the acid at a little higher temperature when brought together.

If the acid is not of the correct strength (specific gravity 1.82 to 1.83), it will be difficult to get a correct test, but the trouble may be partially overcome by using more acid when it is weak and less when it is too strong.

TESTING SKIMMED MILK AND BUTTERMILK

The skimmed milk test bottle (fig. 66) is also used in testing buttermilk, and the operation is the same for each substance. The graduated neck of the skimmed milk test bottle has a very small bore in order to measure the fat accurately. A second neck with larger bore is attached to provide a convenient means of filling the bottle. The smallest divisions on the scale usually indicate .01 of 1 per cent, but on some bottles they indicate .05 of 1 per cent.


FIG. 66. SKIMMED MILK TEST BOTTLE

The same care is necessary in mixing and sampling skimmed milk and buttermilk that is required for whole milk, and the same pipette is used in measuring out the sample. The skimmed milk is added to the test bottle thru the larger neck. Since a little more acid is necessary to thoroly free the fat in skimmed milk, the measure should be filled to about a quarter of an inch above the mark. First add about one-half of the acid, and shake the mixture thoroly; then add the remainder, and again shake it vigorously for about a minute. Avoid throwing undissolved casein into the small neck while mixing the milk with the acid. The bottles are then centrifuged and filled in the same manner as in testing whole milk, except that the first whirling should be continued for ten minutes, instead of five, in order to bring up all the smaller fat globules. The percentage of fat is read immediately on completing the final whirling.

WASHING BABCOCK GLASSWARE

Wash the glassware thoroly between each test. Any fat remaining in the test bottles would increase the following test. First empty the contents of the test bottles on an ash heap or some place where the mixture will not come in contact with the food or the feet of animals. Do not empty the mixture into ordinary sinks or drains because the acid solution will destroy the sink and piping. Then rinse out the bottles with hot water. Add a strong hot solution of a good washing powder until the bottles are half full. Shake them vigorously while emptying them, and pass a small brush thru the necks; then rinse them again using plenty of hot water. The bottles will then be ready to use in another test.

The pipette should be rinsed out with water immediately after measuring out the samples, for if the milk is allowed to dry, it will be difficult to clean the instrument. It should also be washed with the hot soap solution when the bottles are being washed, and well rinsed afterward.

A simple tray for holding test bottles (fig. 67) while carrying or washing them is made by boring twelve or fourteen holes, to fit the bottoms of the bottles, nearly thru a piece of plank 12 inches long, 6 inches wide, and 1.5 inches thick. A cover a half an inch thick is made with corresponding holes. The holes in the cover should be large enough to permit the necks of the bottles to pass thru, but not the bodies.

FIG. 67. TRAY AND COVER FOR HOLDING TEST BOTTLES

When several bottles are to be emptied and washed, they may be placed in the block and the cover placed down over them. By holding the block and cover together at each end, several bottles may be shaken or emptied as quickly as one.

SPECIAL EXPLANATIONS

While one may be able to make the Babcock test successfully without knowing all the basic facts on which it depends, a knowledge of them is often of advantage. This applies especially when difficulties are met in getting correct tests, or when teachers are explaining the test and answering questions. Therefore a few of the fundamental principles are explained here.

SPECIFIC GRAVITY

When equal volumes of milk and water are weighed, it will be found that the milk is heavier. A vessel that holds 1000 grams of water will hold 1032 grams of average milk; or for each gram of water there would be 1.032 grams of milk. $1032 \div 1000 = 1.032$. Therefore 1.032 equals the specific gravity of milk, since it is the existing ratio between the weights of equal volumes of milk and the standard substance water. One cubic

centimeter of water at the proper temperature (4° C., or 39.2° F.) weighs one gram.

THE PIPETTE

The Babcock pipette used in measuring milk test samples delivers 18 grams of milk. 18 ÷ 1.032 (the specific gravity of milk) = 17.44, the cubic centimeters of milk delivered into the test bottle. The pipette is made to hold 17.6 cubic centimeters because it has been found by experiment that the difference between 17.6 cubic centimeters and 17.44 cubic centimeters, or .16 cubic centimeter, remains in the pipette.

THE MILK TEST BOTTLE

When the Babcock test was first invented, the scale on the neck of each test bottle was graduated to read from 0 to 10 per cent. The smallest graduations indicated .2 of 1 per cent. In recent years preference has been given to a test bottle that has a scale in which the smallest divisions indicate .1 of 1 per cent. The scale on this bottle reads from 0 to 8 per cent. Both forms of bottles are in use at the present time.

FIG. 68. CONVENIENT FORM OF SCALES FOR WEIGHING CREAM SAMPLES

This type of scales is especially good for use in schools

The graduated portion of the neck of the 10-per-cent bottle holds 2 cubic centimeters. One cubic centimeter of butterfat at a temperature of 140° F. weighs .9 of a gram. Therefore if the graduated portion of the neck of the milk test bottle were full of fat, it would contain 1.8 grams. That would be 10 per cent of 18 grams. 1.8 ÷ 18 = .10. .1 × 100 = 10 per cent. Eighteen grams is the weight of the milk placed in the test bottle. When 2 cubic centimeters, the volume in the graduated part of the neck, is divided into ten equal parts, one part equals one per cent.

HERD TESTING PROBLEMS

The prices used in these problems are simply for the purpose of

illustration. As the price of milk changes, regular market values may be substituted for the prices here given.

I

A farmer had four cows: Bell, Spot, Fawn, and Dot. The milk produced by each cow in two successive milkings was weighed, sampled, and tested three times during the month of April. The pounds of milk, the percentages of fat, and the dates the samples were taken, are recorded in table 1 as follows:

TABLE 1

April	1	2		10	11		20	21	
	Pounds of milk		Percentage of fat	Pounds of milk		Percentage of fat	Pounds of milk		Percentage of fat
	P. M.	A. M.		P. M.	A. M.		P. M.	A. M.	
Bell	11.0	9.0	4.1	12.0	9.8	4.2	11.8	11.0	4.0
Spot	16.0	15.0	3.2	18.0	15.0	3.1	17.5	16.0	3.1
Fawn	9.0	10.5	3.7	10.0	11.0	3.7	11.4	10.0	3.6
Dot	18.0	17.0	4.4	18.5	17.0	4.5	19.0	17.5	4.3

Problems

1. Find the average number of pounds of milk and of fat that each cow produced per day, and the total number of pounds of milk and of fat produced by each cow for the month.

Solution of the problem for the cow named Bell

	Pounds of milk	Pounds of fat
11.0 + 9.0 =	20.0 × .041 =	.820
12.0 + 9.8 =	21.8 × .042 =	.915
11.8 + 11.0 =	22.8 × .040 =	.912
	3) 64.6	3) 2.647
Average per day =	21.53	.8823
30 days in April	30	30
Total for month =	645.90	26.4690

The cow produced on the average 21.53 pounds of milk and .8823 pounds of fat per day, and during the month she produced 645.9 pounds of milk containing 26.469 pounds of fat.

FIG. 69. MILK-SAMPLING OUTFIT

2. Compute the monthly income from each cow, valuing the milk at $2.75 per hundred pounds.

3. Assuming that each cow gave as much milk as the best one, how much more money would the farmer have received during the month?

II

A herd of cows produced on an average 350 pounds of 3.8-per-cent milk per day during the month of June. The milk could be sold for $2.75 per hundred pounds, or it could be separated and the fat in the cream sold for 52 cents a pound. Assume that if the milk were separated there would be 9520 pounds of skimmed milk containing 7 pounds of fat and that the skimmed milk would be worth 50 cents per 100 pounds when fed to farm animals.

Problems

1. Which method of sale would bring the larger returns, and how much difference would there be?
2. What percentage of fat would the cream contain?
3. What percentage of fat would the skimmed milk contain?

Solutions

1. $350 \times 30 = 10{,}500$, number of pounds of milk for the month
   $105.00 \times \$2.75$ per hundred pounds $= \$288.75$, returns when sold as whole milk
   $10{,}500 \times .038 = 399$, number of pounds of fat in the milk
   $399 - 7 = 392$, number of pounds of fat in the cream
   $392 \times \$.52 = \$203.84$, value of fat in the cream
   $95.20 \times \$.50$ per hundred pounds $= \$47.60$, value of the skimmed milk
   $\$203.84 + \$47.60 = \$251.44$, returns when the milk is separated
   $\$288.75 - \$251.44 = \$37.31$
   Therefore larger returns are obtained by selling the milk, and the difference is $37.31. Answer.
2. $10{,}500 - 9{,}520 = 980$, number of pounds of cream
   $10{,}500 \times .038 = 399$, number of pounds of fat in the milk
   $399 - 7 = 392$, number of pounds of fat in the cream
   $392 \div 980 = .40 \times 100 = 40.0$, per cent of fat in the cream. Answer.
3. $7 \div 9{,}520 = .00073 \times 100 = .073$, per cent of fat in the skimmed milk. Answer.

III

The first year that a farmer kept an exact record of his herd of eight cows, he obtained the results given in table 2.

55

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Dat No.	t. n. s.	% fat	Totals Lbs. milk	Lbs. milk

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TABLE 2

Number of cow	Pounds of milk per year	Average percentage of fat	Cost of feed per year
1	6,520	4.1	$67.00
2	5,740	4.3	67.50
3	5,590	3.9	66.00
4	4,900	4.6	63.00
5	4,625	3.2	61.00
6	4,150	4.0	60.40
7	3,960	3.8	58.00
8	3,425	3.8	55.50

Three years later, after improving his herd by testing, disposing of the poorer animals, selecting better ones, and practicing better feeding methods, the farmer had eight cows that gave the following results (table 3).

TABLE 3

Number of cow	Pounds of milk per year	Average percentage of fat	Cost of feed per year
1	11,862	3.9	$98.60
2	10,143	3.7	95.24
3	8,027	4.6	87.50
4	7,240	3.9	83.45
5	6,354	4.7	81.32
6	6,215	4.0	79.27
7	5,784	4.2	79.00
8	4,966	4.4	76.00

Problems based on the data in tables 2 and 3

1. Compute the number of pounds of fat produced by each cow in (a) table 2, (b) table 3.

2. Find the average number of pounds of milk and of fat for the cows (a) in table 2, (b) in table 3.

3. What would be the value of the milk at $2.75 per hundred pounds for each cow in (a) table 2, (b) table 3?

4. Find for each cow in (a) table 2, (b) table 3, the difference between the cost of the feed and the income when the milk is sold at $2.75 per hundred pounds.

5. Find the value of the milk from each cow in (a) table 2, (b) table 3, computed on a basis of 52 cents a pound for the fat.

6. Find the value of the milk for each cow in (a) table 2, (b) table 3, allowing 52 cents a pound for the fat and 50 cents for the skimmed milk from each 100 pounds of whole milk.

7. Find for each cow in (a) table 2, (b) table 3, the difference between the cost of the feed and the income when the milk is sold on a basis of 52 cents a pound for the fat.

8. Find for each cow in (a) table 2, (b) table 3, the difference between the cost of the feed and the value of the milk, allowing 52 cents a pound for the fat and 50 cents for the skimmed milk from each 100 pounds of whole milk.

9. After deducting the cost of each cow's feed, how many cows like no. 7 in table 2 would it take to give the same income as that from (a) cow no. 1, table 2, (b) cow no. 1, table 3?

10. Compute the total value of the milk in table 2 at $2.75 per 100 pounds, and find how much milk there would have been, and how much it would have brought, if each cow had given as much milk as cow no. 1.

11. Compute the total value of the milk in table 3 at $2.75 per 100 pounds, and find how much more it would have brought if each cow had given as much milk as no. 1.

12. When milk is valued at $2.75 per 100 pounds, how much more would the owner of the cows in table 2 have received if each cow had given as much milk as cow no. 1 in table 3?

13. How much butter may be made from the 4625 pounds of milk from cow no. 5, table 2, if there is no loss of fat? (In calculating the yield of butter it may be assumed that one pound of fat will yield 1.2 pounds of butter.)

$4{,}625 \times .032 = 148$, number of pounds of fat
$148 \times 1.2 = 177.6$, number of pounds of butter

14. How much butter may be made from the 6354 pounds of milk from cow no. 5, table 3, if there is no loss of fat?

15. How much money would be returned to the farmer by each cow in problems 13 and 14 after deducting the cost of the feed and allowing 50 cents a pound for the butter?

QUESTIONS AND ANSWERS

These questions and answers were suggested by many inquiries received from dairymen.

1. What are the principal substances and the percentage of each in average milk? Water, 87.37 per cent; fat, 3.8 per cent; casein, 2.6 per cent; sugar, 4.8 per cent; albumin, .71 per cent; ash, .72 per cent.
2. What substances make up the milk solids? All the constituents, except the water.

3. What percentage of solids is found in milk of average composition? About 12.63 per cent.
4. How are the solids of milk sometimes classified for the purpose of comparison? They are classified as fat and solids not fat.
5. What is the average percentage of solids not fat in milk? About 8.83 per cent.
6. Which constituent of milk is the most variable in amount? The fat.
7. Between what limits is the percentage of fat usually found? Between 3 per cent and 6 per cent.
8. What is meant when it is said that average milk contains 3.8 per cent of fat? This means that 100 pounds of milk of average composition contains 3.8 pounds of milk-fat.
9. In what condition does the fat in milk exist? It is present in the form of very minute round particles called globules.
10. What is another property that distinguishes the fat from the other milk substances? It is lighter in weight than the other milk substances.
11. How does the dairyman make use of these properties of the fat? The lighter fat globules come to the top of the *milk serum* (skimmed milk) when he sets the milk, and he skims them off as cream with some of the serum; or he passes the milk thru a separator, and draws the cream off from the center of the revolving bowl, while most of the heavier milk serum is thrown to the outside of the bowl and is drawn off thru a separator spout.
12. Are milk serum and skimmed milk the same substance? Yes.
13. How does the serum after separation differ from the cream? The serum contains only traces of fat, while the cream is made up of both milk serum and fat.
14. Does the serum of cream differ from the serum forming skimmed milk? The serum in each substance is the same.
15. What is meant when dairymen speak of 30-per-cent cream? They mean that 100 pounds of the cream contains 30 pounds of fat and 70 pounds of milk serum.
16. What is the legal requirement for milk in New York State? Milk offered for sale in New York State must be clean and pure, and drawn from healthy cows. Nothing may be added to it and nothing taken from it, and it must contain at least 3 per cent of fat and 11.5 per cent of solids.
17. Does the 11.5 per cent of solids include the fat? Yes.
18. Give the legal requirement for cream in New York State. Cream must be made from clean pure milk, and contain not less than 18 per cent of fat.

19. How does the skimmed milk obtained by setting the milk differ from that obtained by passing the milk thru a good separator? The skimmed milk from the separator contains less fat.
20. How much difference might one expect to find in the skimmed milk obtained by these two methods? The skimmed milk from the separator should contain less than .1 of 1 per cent of fat, while the other would probably contain between .25 and .5 of 1 per cent of fat.
21. What is buttermilk? Buttermilk is the substance found in the churn with the butter when the process of churning cream is completed.
22. Which substance in cream forms the butter and which the buttermilk? The fat globules in the cream unite during the churning process to form butter, while the serum of the cream remains as buttermilk.
23. Should not buttermilk, therefore, be very much like skimmed milk, since both are the same as milk serum? Buttermilk is the same as sour skimmed milk, and contains about the same percentage of fat as skimmed milk from the setting process, except that the lumps of casein in the buttermilk have been broken into small particles during churning.
24. Why does milk turn sour and the casein coagulate? Little plants, called bacteria, change the milk sugar into a substance known as lactic acid. The acid gives milk a sour taste and brings about the coagulation of the casein.
25. How do bacteria usually enter milk? Bacteria fall in from the air on particles of dust or dirt, or they may be on the milk pails or other utensils.
26. What can a milk producer do to keep the bacteria out, and to prevent the milk from souring? Keep the stable and the cattle clean. Wipe off the cow's udder and surrounding parts with a damp cloth immediately before milking. Use milk utensils that have been thoroly cleaned and then sterilized with boiling water, or live steam for 30 minutes. Wash the hands just before milking. Use small-top milking pails. Milk with dry hands. Cool the milk to a temperature below 50° F. and keep it cold.

THE CORNELL READING COURSE FOR THE FARM

The Cornell Reading Course for the Farm provides consecutive instruction on subjects selected by the reader, furnishes lessons on subjects of general interest as they are issued, and encourages correspondence by means of the discussion paper. Residents of New York State may register without charge for one or more of the following series in the reading course. If particular lessons are desired instead of a course of reading they may be obtained on request.

THE SOIL

74 Introduction to the principles of soil fertility
42 Tilth and tillage of the soil
70 Soil moisture and crop production
78 Land drainage and soil efficiency
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DAIRYING

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102 Cooling milk
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FRUIT GROWING
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84 Insects injurious to the fruit of the apple
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94 The farm fishpond
96 The surroundings of the farm home
59 Sewage disposal for country homes

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THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 140 | DAIRYING SERIES | DECEMBER, 1918

THE BABCOCK TEST, AND TESTING PROBLEMS

DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

The available reading course lessons for the farm are arranged in series on the following subjects: THE SOIL, FARM CROPS, LIVESTOCK, DAIRYING, FRUIT GROWING, THE HORSE, POULTRY, VEGETABLE GARDENING, FLOWER GROWING, BEEKEEPING, PLANT BREEDING, FARM FORESTRY, COUNTRY LIFE. New readers may enroll in one or more of these subjects. The first lesson in the series is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. The reader may register for the Dairying Series by signing and returning this discussion paper. The space below on this page is reserved for registration in other series, and also for names and addresses of residents of New York State likely to become interested in the reading course.

(Detach, sign, and return for the next lesson in this series.)

(In answering questions, attach additional paper if needed and number the answers.)

1. What are the principal causes of variation in the composition of pure milk?

2. Is it possible to distinguish the best cow in a herd without keeping a record sheet?

3. When is a record sheet of each cow in a dairy of value to the dairyman?

4. Why does the butter churned from a given amount of milk or cream weigh more than the fat that the milk or cream contained?

5. Why is it permissible to measure the milk into the test bottle, and why necessary to weigh the cream into the cream test bottle?

6. Why is sulfuric acid used in the Babcock test?

7. (a) How may one readily determine whether sulfuric acid is of proper strength for use in the Babcock test?

(b) If the acid were not of proper strength, how might it affect the appearance of the fat column in a completed test?

8. Why is a larger proportion of sulfuric acid used in testing milk than in testing cream?

9. Why is it necessary to have the hand centrifuge hot during the test?

10. Why should the curved surface at the top of the fat column be included in the percentage reading of the milk test, but not included in the reading of the cream test?

11. How may the Babcock test in the rural school be used to the advantage of the pupils and farmers in the school district?

Name...

Address..

Date...

(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
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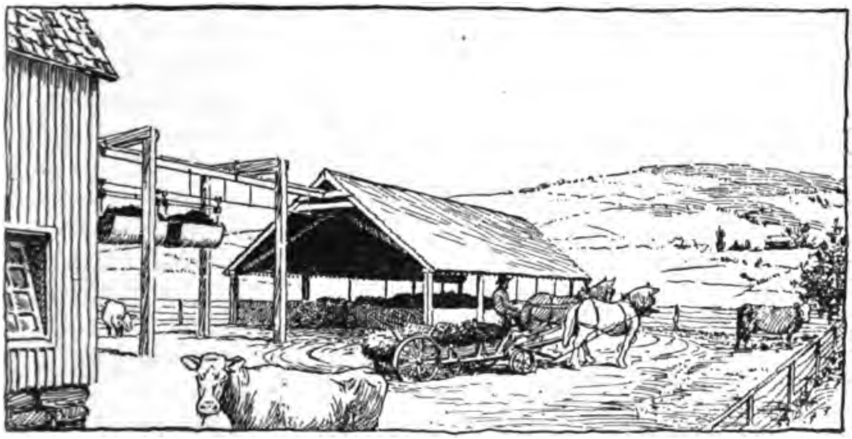
LESSON 141 THE SOIL SERIES JANUARY, 1919

FARM MANURE

ITS PRODUCTION, CONSERVATION, AND USE

ELMER O. FIPPIN



A MODERN COVERED MANURE PIT

Published and distributed in furtherance of the purposes provided for in the
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THE CORNELL READING COURSE FOR THE FARM

SUPERVISOR
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BRISTOW ADAMS
RUTH VAN DEMAN

"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture."—ABRAHAM LINCOLN

The increased area for world food production in 1919 indicates that New York farmers should return to sound permanent systems of farming. The combination of cultivated thought with labor not only is agreeable but results in efficiency in farming, which makes profits possible when price levels are becoming lower. The State College of Agriculture offers lessons for home study free to residents of New York State. The reader may obtain consecutive instruction on the subjects in which he is interested, and also the new lessons as issued. The attached discussion paper gives further information.

The reading course lessons for the farm are elementary and brief, and are intended to arouse a desire for additional knowledge. Advanced reading courses in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods. Reports on reading and practical exercises are corrected, graded, and returned to the reader with suggestions from specialists. The only expense in each advanced reading course is the cost of a textbook and practice material.

The reading course lessons may be the basis for educational programs in granges and other local organizations. In a number of communities groups have organized for the discussion and study of common problems, and have adopted the name Cornell Study Club. This may be done in connection with an existing organization or independently. Assistance is given in organizing and conducting Cornell study clubs.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

FARM MANURE: ITS PRODUCTION, CONSERVATION, AND USE

Elmer O. Fippin

The manure of farm animals is in the aggregate enormous in amount, and, when wisely used, is a most valuable contribution to soil improvement. In New York State the animals on farms produce approximately thirty million tons annually, which is sufficient, if it were all saved, to make an application of three and a half tons on every acre of tilled, grain, hay, and fruit crops in the State. Excluding the hay land, it is sufficient to provide six tons per acre for all the other crops. The gross value of this manure, conservatively estimated, is equal to the annual expenses of the State government. In addition, the animals in towns and cities produce four million tons annually.

The manure of animals is a valuable by-product of animal husbandry for the same reason that the abattoir products, when turned into commercial fertilizers, are valuable by-products of the meat-packing industry. Manure is valuable because it contains certain constituents that the animal has derived from its food. This lesson classifies these constituents and points out their effect on the soil, gives the proportion of each constituent returned in the manure as compared with the amount in the food consumed, states the amount, composition, and value of manure from various farm animals, and suggests methods of conserving and applying manure. All these topics are discussed from the viewpoint of the requirements of soils for the production of good crops.

CONSTITUENTS OF MANURE

There are three groups of constituents that make the manure of animals valuable in crop production: namely, (1) the plant nutrients — nitrogen, phosphorus, potassium, and some other elements; (2) the organic matter; (3) the organisms that carry on active processes of decay. Of the last division, very little can be said further than that these organisms serve as an inoculating culture in the soil and carry forward biological changes and processes of decay. The nature of these organisms is still very imperfectly understood and means are not available for their extensive control.

EFFECTS OF MANURE ON THE SOIL

The effects of manure on the productive capacity of the soil are as broad as the effects of its constituents. They illustrate a fact common in soil

management; namely, that a particular treatment seldom has a single effect but rather a group of effects, some perhaps more evident than others. In selecting a treatment one must therefore consider what effect is desired as well as the possibility of the treatment giving the desired effect. The effect of manure, like the effect of organic matter, may be discussed under three general heads: physical, chemical, biological.

PHYSICAL EFFECTS DUE TO ORGANIC MATTER

1. The humus produced increases the granular structure and improves the tilth of the soil.

2. The improved tilth affords better drainage and better aeration of the soil.

3. The humus and the improved tilth increase the available moisture capacity of the soil and enable crops to better withstand drought.

4. Roots of crops are better able to penetrate the heavier soils and obtain the moisture and the plant-food required.

5. The humus darkens the color of the soil and thereby tends to maintain a higher average temperature, which makes more active many important processes in the soil.

CHEMICAL EFFECTS

1. Manure supplies the soil with all the elements of plant nutrition, especially with nitrogen and potash in which manure is particularly rich. As a result of the changes to which the food of animals is subjected in the process of transformation into manure, all the constituents are made more available than in the original food or in ordinary forms of organic matter.

2. The surplus of basic soluble materials in manure — the ammonia and the ash materials — aids in maintaining the alkaline condition of the soil essential for most crops. Liquid manure in particular is rich in these alkaline constituents.

3. The organic materials, including many acid compounds produced during the process of decay, increase the availability of the plant nutrients in the soil.

4. It has been shown that plants can utilize directly some organic compounds, and it seems probable that those resulting from the partial decay of manure may to some extent be used directly by growing crops in this intermediate organized form, thereby conserving the energy of the sun and the growing processes of the plant. This may produce a more rapid growth of plants than is possible with mineral plant nutrients alone.

BIOLOGICAL EFFECTS

1. The processes of decay set in motion in the digestive tract of the animal break down the constituents of the food and thereby increase their availability in manure.

2. The flora of manure appears to have an important relation to the biological processes in the soil, including the decay of crop residues.

3. The organic matter of manure affords a source of energy for organisms in the soil that contribute to productiveness. Nitrogen fixation by free living forms of bacteria has been shown to be dependent on such a supply of organic matter.

ACTION OF ANIMALS ON FOOD CONSUMED

Because of these numerous effects of the constituents of manure — the organic matter and the mineral plant nutrients — it is important that their course from the food thru the animal and in the subsequent management of the manure be carefully traced. In this way the value of the manure in relation to the total value of those constituents in the food consumed may be determined and the largest practicable conservation of all those materials brought about.

The animal consumes food for two main purposes: (1) to supply fuel for heat and energy; (2) to build up the body tissues and manufacture a product, such as meat, milk, eggs, or wool. The organic material supplies heat and energy for the animal body as does coal for the boiler or gas for the lamp. All the organic matter in the food must be accounted for. If it does not appear in the manure, it must have been retained in the animal body and turned into animal products, such as milk, or dissipated in the form of heat and energy. Nearly all the organic matter of the food that is digested is permanently withheld from the manure and constitutes a net loss in so far as the fertility of the soil is concerned.

The animal products other than heat and energy, so far as the manurial value of the food is concerned, draw upon both the organic matter and the nutrients. The larger the production of milk, meat, or wool, the larger is the abstraction of the plant nutrients consumed, and the smaller is the return in the manure. Milk production involves a larger abstraction of plant nutrients than does meat or wool production. All these forms of loss fall on the digested part of the food. The undigested food is never a part of the body, tho it passes thru and is voided with some loss by decay in the process. The waste from the digested portion of the food that is used by the animal to develop heat and energy, that is, to maintain the body, is represented by the solid manure, feces, or dung.

PROPORTION OF ORGANIC MATTER AND PLANT NUTRIENTS IN MANURE

Organic matter is a valuable constituent of manure. It has been customary to value manure for its content of plant nutrients — nitrogen, phosphorus, and potassium — and to say very little about the organic matter. In this lesson the distribution of the organic matter as well as the plant nutrients, will be traced, since that material is quite as important in the system of soil fertility as are the plant nutrients.

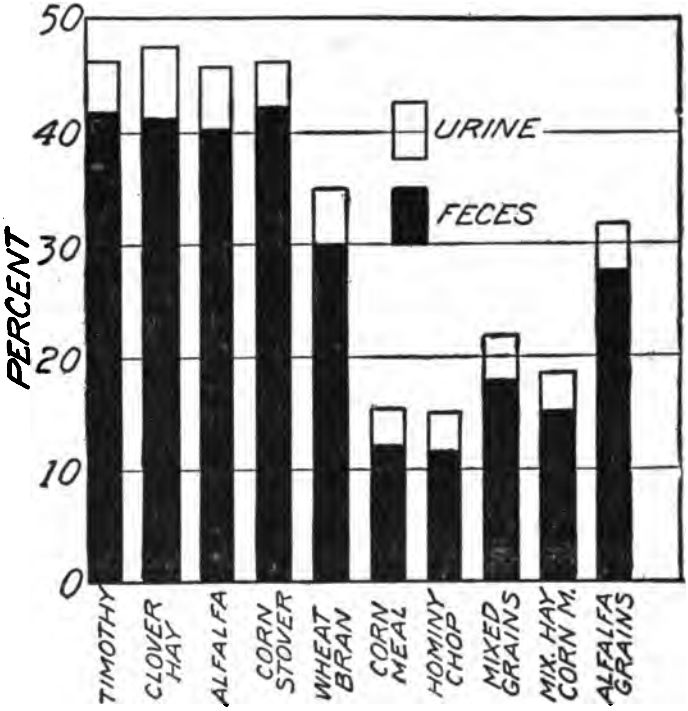

FIG. 70. PROPORTION OF THE ORGANIC MATTER IN DIFFERENT ANIMAL FOODS REGAINED IN THE MANURE OF THE STEER

Digestion experiments have been most often carried on with the steer and the sheep. The results with the steer are taken as the primary basis of the statements made in this lesson but are modified by available data on the digestive and assimilative processes in the cow. Dr. H. P. Armsby, of the Pennsylvania State College, has measured the digestibility of common feeds by steers in terms of energy units in the feed and in the waste products of the animal. He finds that about 50 per cent, or a little more, of coarse forage is digested, depending on its quality. This means that on the average less than 50 per cent of the organic matter

present in the food is returned in the manure. As a rule, the return is from 40 to 55 per cent for dry forage and gradually decreases for the less fibrous and more concentrated foods until for cornmeal and hominy it is only from 10 to 15 per cent. Energy is here regarded as synonymous with organic matter, or humus-making material. In other words, these concentrated foods are very efficient as fuel, but when fed to animals they are very inefficient as a means of returning organic matter to the soil. These facts are presented graphically in figure 70. A standard ration

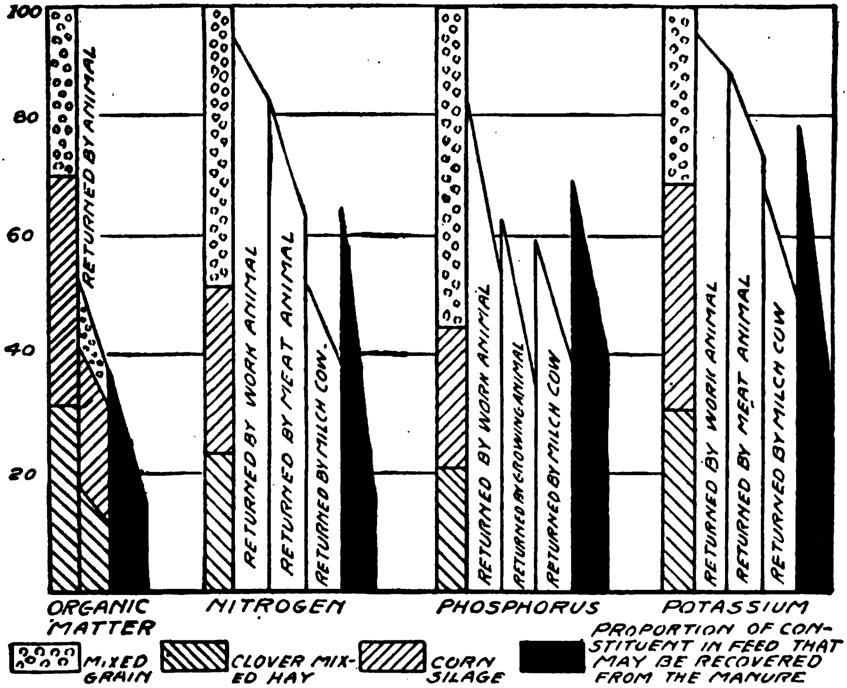

FIG. 71. PROPORTION OF CONSTITUENTS IN ANIMAL FOODS REGAINED IN THE MANURE

The blocks at the left of each group represent the distribution of one hundred pounds of the constituent among the several foods consumed. The middle blocks show the proportion of the constituent returned by the animal in the manure. The right-hand blocks show the proportion of one hundred pounds of the constituent in food that may be saved in the manure. The slope at the top of each block represents the range of variation

is a composite of feeds, and of these the animal returns from 30 to 45 per cent of the organic matter consumed. This is practically all found in the undigested part of the food. There is, it is true, from 4 to 6 per cent of the energy of the feed in the liquid manure, but that material is subject to rapid bacterial changes and is of questionable value. The undigested food, represented by the dung, undergoes an appreciable loss thru decomposition in the digestive tract of the animal. This is largely represented by the bowel gases, which use from 4 to 10 per cent of the food consumed.

This diversion from the soil and heavy loss of organic matter in the process of feeding animals should cause the farmer to hesitate if he is keeping stock primarily for the manure produced or if organic matter is the chief and controlling need of his soil, since other less wasteful methods may be employed. The practice of feeding animals must show a substantial profit on its own account if it is to be justified as a method of improving soil.

The plant nutrients are returned in both the liquid and the solid manure; therefore they follow a different course than the organic matter. A work animal that is not changing in weight returns nearly all of the plant nutrients consumed. A dairy cow that is producing a large flow of milk abstracts a correspondingly large part of the plant nutrients from her feed. This is a distinction between meat or work animals and dairy animals that has been neglected. The return of nitrogen is subject to the greatest variation by the animal, and the return of potassium to the least. A dairy cow giving a heavy flow of milk returns from 40 to 65 per cent of the nitrogen consumed, from 60 to 80 per cent of the phosphorus, and from 70 to 85 per cent of the potassium. A cow giving a small flow of milk returns a correspondingly larger amount of nitrogen, phosphorus, and potassium. An ox or a meat animal returns from 75 to 95 per cent of the nitrogen, from 65 to 85 per cent of the phosphorus, and from 90 to 98 per cent, or even more, of the potassium. Growing animals retain practically all the phosphorus in the digested part of the food. This means that in the undigested part of the food there remains less than half of the total amount of phosphorus consumed to find its way into the manure. These figures are summarized in table 1.

TABLE 1. LOSS OF CONSTITUENTS OF FOOD IN PROCESS OF DIGESTION SHOWN BY THE PROPORTION RETURNED IN THE MANURE

	Percentage
Organic matter	
Average dairy ration	45
Heavy concentrate ration	35
Coarse fibrous roughage ration	55 to 65
Nitrogen	
Dairy animals	35 to 75
Meat animals	65 to 90
Work animals	85 to 95
Phosphorus	
Young growing animals	35 to 50
Dairy animals	50 to 80
Work animals	75 to 95
Potassium	
Dairy animals	65 to 85
Meat animals	75 to 90
Work animals	90 to 98

In New York, where the dairy animal is such an important type of livestock, the heavy draft it makes on the organic matter and the plant nutrients in the food and the corresponding smaller return in the manure, as compared with that made by other types of animals, should be kept clearly in mind. The larger the milk production of the cow, the smaller is the proportion of the food returned in her manure. The approximate

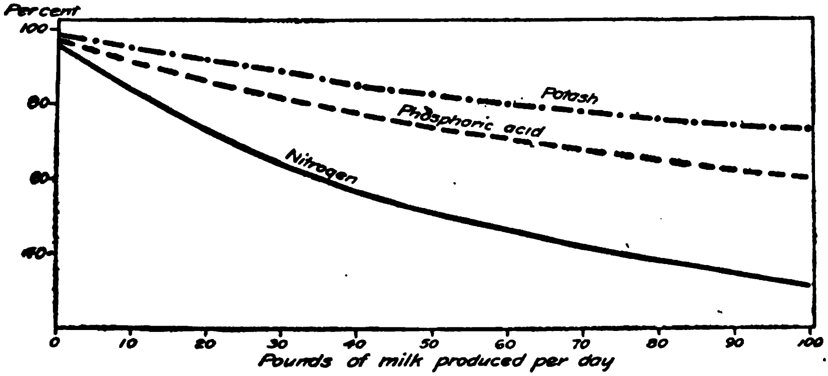

FIG. 72. APPROXIMATE PROPORTION OF PLANT NUTRIENTS IN FOOD RETURNED IN THE MANURE IN RELATION TO THE AMOUNT OF MILK PRODUCED

Milk is relatively richer in nitrogen than are the foods ordinarily consumed by milch cows. It corresponds approximately to the ratio 7 parts of nitrogen to 1 part of phosphoric acid to 2 parts of potash. A balanced ration corresponds approximately to the ratio 2.5 parts of nitrogen to 1 part of phosphoric acid to 2.2 parts of potash. Consequently there is less relative loss of the mineral plant nutrients than of nitrogen in feeding milch cows. This ratio is subject to much variation corresponding to the large variation in the composition of feeds

value of the manure of an animal may be calculated from the amount and composition of the food consumed, provided the proper discounts are kept in mind. The production and the composition of the manure in comparison with the food consumed are illustrated in the results of a study carried out on the Cornell University dairy herd (table 2). The test was carried on for seven days on a herd of forty-six milch cows weighing an

TABLE 2. PRODUCTION OF MANURE BY THE CORNELL UNIVERSITY HERD PER THOUSAND POUNDS LIVE WEIGHT

	Daily amount	Annual amount
Clear excrement produced	75.5 pounds	13.75 tons
Excrement produced with bedding	85.7 pounds	15.60 tons
Organic matter consumed	21.1 pounds	7,700 pounds
Organic matter voided	9.18 pounds	3,350 pounds
Proportion of organic matter regained	43.3 per cent	....
Nitrogen consumed	0.585 pounds	215 pounds
Nitrogen voided	0.26 pound	94 pounds
Proportion of nitrogen regained	44.3 per cent	....
Proportion of ash regained	63.6 per cent	....
Proportion of water in manure	81.8 per cent	....

average of 1008 pounds each. They received a good ration of alfalfa hay, silage, roots, and mixed grain. All feeds were weighed and analyzed. The manure, which was collected on tight floors and in drops, was also analyzed.

The return in the manure of the organic matter in the food consumed was about equivalent to the undigested portion of the food. The proportion of the organic matter in the food consumed which was regained in the manure was about the same as the proportion of the nitrogen and twenty per cent less than the proportion of the plant nutrients regained in the manure.

AMOUNT AND COMPOSITION OF MANURE

The composition of both the liquid and the solid manure varies with the kind of food consumed and with the function of the animal. A young growing animal or an animal producing milk withholds more of its food than an animal producing meat or energy. A nitrogenous diet produces a manure rich in nitrogen. When a nitrogen-rich ration was fed to poultry, the proportion of all the constituents in the manure was found to be one-third more than when a carbonaceous ration was fed. A similar difference has been found when these two types of rations were fed to larger animals.

The relative production and composition of the liquid and the solid manure produced by one thousand pounds of live weight of the common farm animals is given in table 3.

The wide variation in the total amount of both liquid and solid manure produced by different animals, as shown in table 3, is due mostly to the amount of water introduced. The total annual production of manure, both liquid and solid, for one thousand pounds of live weight varies from five tons for poultry to fifteen tons for the pig. The total amount of dry matter and of the several plant nutrients does not differ widely for one thousand pounds of live weight of the different farm animals. The amount of dry matter in the manure is from two to two and one-fourth tons. In all animals except the horse the total return of nitrogen is largest in the urine. On the other hand the distribution of potash is irregular; the horse, the pig, and the sheep return the larger amount in the dung, while the cow returns the larger amount in the urine. Phosphorus is found only in very small amounts in the urine of all animals.

As a result of the different proportions of water in the manure of different animals, it has important characteristics that vitally affect its economical storage and its efficient use for certain purposes. The manure from the horse and the sheep is relatively dry and porous, undergoes rapid decomposition, and quickly develops a high temperature when stored in a large mass. The same action occurs in poultry manure, which has much the

TABLE 3. COMPOSITION AND VALUE OF THE MANURE OF FARM ANIMALS PER THOUSAND POUNDS OF LIVE WEIGHT

Animal	Constituent	Pounds produced per year	Water		Dry matter		Nitrogen		Phosphoric acid *		Potash †		Commercial value ‡			
			Percentage	Pounds	Percentage	Pounds	Percentage	Pounds	Percentage	Pounds	Percentage	Pounds	Plant nutrients	Organic matter	Total	Per ton
Horse	Urine	4,000	90	3,600	10	400	1.45	60	Trace	Trace	1.20	48	$11.50	$ .80	$12.30	$6.05
	Dung	14,500	70	10,150	30	4,350	0.45	66	0.30	44	0.40	58	14.60	8.70	23.30	3.10
	Total	18,500	74	13,750	26	4,750	0.72	126	0.27	50	0.57	106	26.10	9.50	35.60	3.85
Cow	Urine	8,000	93	7,440	7	560	0.80	64	Trace	Trace	1.00	80	$13.60	$1.10	$14.70	$3.65
	Dung	18,000	80	14,400	20	3,600	0.35	63	0.20	36	0.75	45	13.10	7.20	20.30	2.25
	Total	26,000	84	21,840	16	4,160	0.49	127	0.15	40	0.48	125	26.70	8.30	35.00	2.70
Pig	Urine	12,000	96	11,520	4	480	0.50	60	0.01	12	0.60	72	$13.10	$ .95	$14.05	$2.35
	Dung	18,000	78	14,040	22	3,960	0.30	54	0.25	45	0.30	54	12.60	7.90	20.50	2.25
	Total	30,000	85	25,560	15	4,440	0.38	114	0.19	57	0.42	126	25.70	8.85	34.55	2.30
Sheep	Urine	4,500	87	3,915	13	585	1.50	68	0.05	23	1.80	57	$14.00	$1.20	$15.20	$6.80
	Dung	8,500	55	4,675	45	3,825	0.80	68	0.40	34	0.50	43	13.75	7.65	21.40	5.00
	Total	13,000	66	8,590	34	4,410	1.05	136	0.44	57	0.77	100	27.75	8.85	36.60	5.65
Hen	Total	10,000	55	5,500	45	4,500	1.30	130	0.80	80	0.90	90	$27.20	$9.00	$36.20	$7.25

* In order to convert figures for phosphoric acid into terms of phosphorus, multiply by 0.4366.
† In order to convert figures for potash into terms of potassium, multiply by 0.832.
‡ Nitrogen is valued at 15 cents per pound, phosphoric acid at 4 cents per pound, potash at 5 cents per pound, and organic matter at 20 cents per one hundred pounds.

same characteristics. The hen voids its urine with the dung. On the other hand the large amount of water in the manure of the cow and the pig produces a dense, heavy, cold manure that does not heat and in a large mass does not undergo rapid decay. These characteristics will be referred to in discussing the preservation of manure.

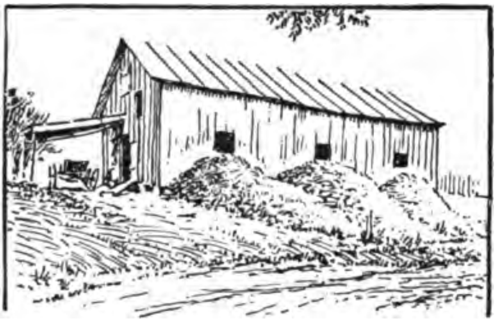

FIG. 73. WASTEFUL STORAGE OF MANURE
The result of such practice is shown in figure 74

VALUE OF MANURE

The annual value of the manure of different farm animals per thousand pounds of live weight and per ton is given in table 3. In every case, at the scheduled price of the organic matter and the plant nutrients, the urine is more valuable per ton than the dung. The value per ton of both urine and dung increases regularly with the proportion of dry matter. When all the urine and dung are saved together, the value of the mixed material per ton ranges from $2.30 for the pig to $5.65 for the sheep and $7.25 for the hen. The manure of all these animals, especially of the horse, the sheep, and the hen, is generally handled in a drier form than when freshly voided, that of the sheep and the hen frequently in the air-dried form. Such material has a correspondingly higher value in proportion to the water removed, and poultry and sheep manure may be worth as much as fourteen dollars per ton at the schedule of prices used. The annual value of the manure of animals per thousand pounds of live weight ranges from twelve to fifteen dollars for the urine and from twenty to twenty-three dollars for the dung, that is, the value of the dung is about twice as much as that of the urine. The total annual value of both urine and dung produced by a thousand pounds of live weight is surprisingly uniform and averages about thirty-six dollars at the prices used in these calculations. There is of course some question

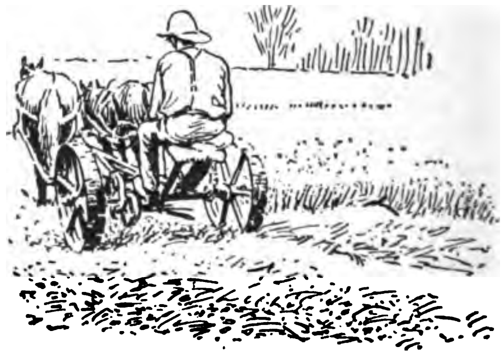

FIG. 74. CONSEQUENCE OF WASTING MANURE
The hay crop does not derive much benefit from leached manure

as to whether such high values should be placed on the constituents. These prices, namely, fifteen cents per pound for nitrogen, four cents per pound for phosphoric acid, five cents per pound for potash, and twenty cents per one hundred pounds for organic matter, are a little below the prices that prevailed for many years for these materials at wholesale. Their availability however is probably considerably below that of the same constituents in the best commercial fertilizers; therefore these figures on value are fairly comparable with those for the commercial materials.

It has not been customary to assign a definite value to the organic matter in manure or commercial fertilizers. It should be duly credited in the purchase of all kinds of fertilizer, however, because of the important part it plays in the whole system of crop production and soil fertility.

FIG. 75. ONE METHOD OF CONSERVING MANURE

A concrete platform slightly hollowed on which to collect the daily production

LOSSES OF MANURE IN HANDLING

Not all the manure of animals, especially work animals, is voided under conditions that permit its best storage and use. Such losses are inevitable and to eliminate them would interfere with the reasonable use and handling of the animal. With animals kept for some purpose other than work there is likely to be a similar but smaller loss. These losses can only be estimated. They may run from as much as forty per cent for the horse in regular work to fifteen per cent for meat and dairy animals kept in the stable or on pasture nearly all the time.

When manure is stored, whether in the stables, in a specially constructed pit, or in the soil, some loss is inevitable in the constituents that make it valuable. The important questions are: (1) Which method of handling manure entails the least loss, and (2) When in the system of cropping can the manure be applied to give the largest profit per ton used. The latter question is considered in some detail on page 186, but it is related to the problem of storing manure since the loss from storage may be as large as the gain from applying the manure at a particular point in the system of cropping.

The losses to which manure is subject may occur in four ways: (1) failure to preserve the liquid; (2) leaching by rain; (3) decomposition of the organic matter; (4) biological changes in the nitrogen of the manure by which it is converted into volatile forms that may pass off as vapor, chiefly as ammonia.

CONSERVATION OF LIQUID MANURE

The liquid manure should be retained by tight drops and floors. Clay floors absorb fifteen or twenty per cent of the liquid manure and floors of more porous soil a larger percentage. Concrete floors, now so generally in use, preserve the liquid manure very well, and are the most sanitary. Wooden floors may be made tight but are less sanitary and less easily cleaned.

ABSORBENTS AND LITTER

The large amount of liquid manure produced by most animals makes it difficult to handle. When absorbed by litter or bedding, it may be readily moved with the solid manure, and tight receptacles are not so necessary. Straw is the most commonly used absorbent in all grain-producing sections, and when cut into short lengths its absorbing capacity is increased. Any absorbent material may be used, but the six following points should be considered: (1) the absorbing capacity of the material; (2) its inherent manurial value for both organic matter and plant nutrients; (3) the possibility of fouling the stable and the animals when it has absorbed the liquid; (4) the possibility of injurious effects on the animals and the crops; (5) the cost and convenience of using the material; (6) the capacity of the material to absorb and retain ammonia, which is the chief form in which nitrogen is present and subject to loss. The approximate capacity of various materials for absorbing water and ammonia is shown in table 4.[1]

TABLE 4. CAPACITY OF DIFFERENT LITTERS FOR ABSORBING AND RETAINING WATER AND AMMONIA

Kind of material	Number of pounds of water retained by 100 pounds of material after 24 hours	Number of pounds of ammonia absorbed by 100 pounds of different materials
Wheat straw	220	0.17
Oat straw	285	....
Pea straw	280	....
Chopped corn stover	350	....
Partly decomposed oak leaves	162	....
Moss and forest leaves	275	....
Dead leaves	200	....
Needles of coniferous trees	175	....
Sawdust	435	0.05
Shavings	375	....
Spent tanbark	450	....
Air-dried humous soil	50	0.66
Peat	600	1.10
Peat moss	1,000	0.86
Sand soil	20	....
Loam soil	35	....
Clay soil	45	....
Muck soil	450	....

[1] Part of the data for this table was taken from *Manures and Fertilizers*, by Homer J. Wheeler.

The inherent manurial value of absorbent material varies, as is shown in table 5.

TABLE 5. APPROXIMATE COMPOSITION OF SOME COMMON BEDDING MATERIALS

Kind of material	In 100 pounds of air-dried material			
	Organic matter (pounds)	Nitrogen (pounds)	Phosphoric acid (pounds)	Potash (pounds)
Wheat straw	80	0.5	0.25	0.80
Oat straw	80	0.6	0.30	1.20
Corn stover	70	1.0	0.30	1.40
Peat moss	65	1.0	0.20	0.20
Muck	50	1.5	0.25	0.30
Dried forest leaves, oak	75	1.0	0.20	0.35
Pine needles	80	1.0	0.20	0.15
Sawdust	90	0.2	0.10	0.40
Shavings, soft wood	90	0.1	0.10	0.30

These figures do not reveal any large differences in the manurial value of bedding materials. The materials based upon the wood of trees have the lower value.

Straw, shavings, moss, and all fibrous materials are preferred as bedding to those of fine texture, such as soil and muck, which take on a semiliquid form when saturated and seriously foul the stable and the stock. Muck and peat are naturally rather full of water and must be dried to be of use. They may be brought from the bog in dry periods during the summer and placed in a pile under cover where the surface material will dry and can be raked off and used.

The possibility of injurious effects refers particularly to the composition of shavings, sawdust, and tanbark. A common constituent is tannic acid, which is particularly abundant in the wood and bark of the hemlock and the oak and is injurious to crop growth when the material is used in excessive amounts. Manure made up largely of such material cannot be used in hotbeds or for vegetable culture where very large amounts are applied, because it does not heat and decay readily and may directly injure plants. But in ordinary farm practice, where the application of manure is not more than twenty to thirty tons per acre, and where the manure is thoroly incorporated with the soil, such material is not considered objectionable.

For absorbing ammonia, one of the very best materials is moist soil. Both the water and the solid material take up that compound in rather large amounts. In fact field soil has a large capacity for absorbing all the soluble constituents of manure. Water alone will take up about seven hundred times its own volume of ammonia gas at ordinary room temper-

ature and nearly twice that amount at the freezing point. This has a bearing on the application of manure to the soil as well as in the use of soil as a stable absorbent. Dry soil, loamy sand, and dried muck are most commonly used to dry out poultry manure so that it can be stored. This capacity of the soil for absorbing the constituents of manure is best utilized by applying the manure directly to the field. The soil prevents any appreciable loss by leaching if it is not already full of water. The one case in which the direct application of manure to the land involves large loss is when the soil is wet and in need of drainage. Then the constituents do not come in close contact with the soil. Under any other condition the constituents of the manure are held in the upper layer of soil.

FIG. 76. THE MOST WASTEFUL METHOD OF STORING MANURE

CISTERNS

One of the best methods of storing liquid manure is in cisterns by means of a system of drains from the stables. The liquid does undergo some decay with resultant loss of ammonia, but the very complete exclusion of the air makes this less than in storage by any other method. Even in a cistern nine and a half feet deep there was in one investigation a loss of 21.7 per cent of the nitrogen in a period of eight months.

American farmers have not developed the habit or the facilities for handling liquid manure from the cistern to the field as have the farmers of some other countries. This is best accomplished by pumping the liquid from the cistern into a tank wagon in which it is carried to the field. It may be distributed by means of a large hose attached to the lowest part of the tank. On the discharge

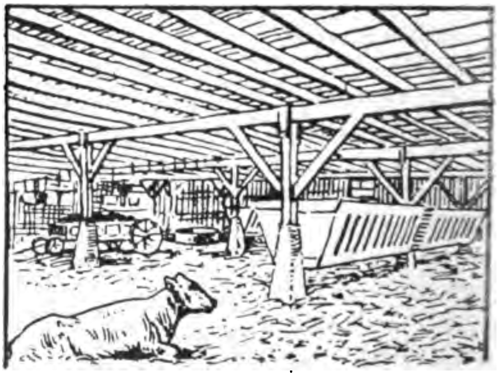

FIG. 77. AN EXCELLENT PLACE TO STORE MANURE

A covered barnyard or feed lot or a basement where the manure is accumulated with plenty of bedding and is thoroly packed by tramping, affords the proper conditions for storing manure

end should be fitted a metal nozzle flattened to one-eighth to three-sixteenths inch opening so that it discharges a broad flaring sheet of liquid. Liquid manure is best applied on grassland early in the spring but is excellent on vegetable and forage crops.

CONSERVATION OF SOLID MANURE

Dung is subject to loss if it is leached by rain water. The process of digestion and decay makes a considerable part of this material soluble, so that it is readily removed by leaching. For this reason any method

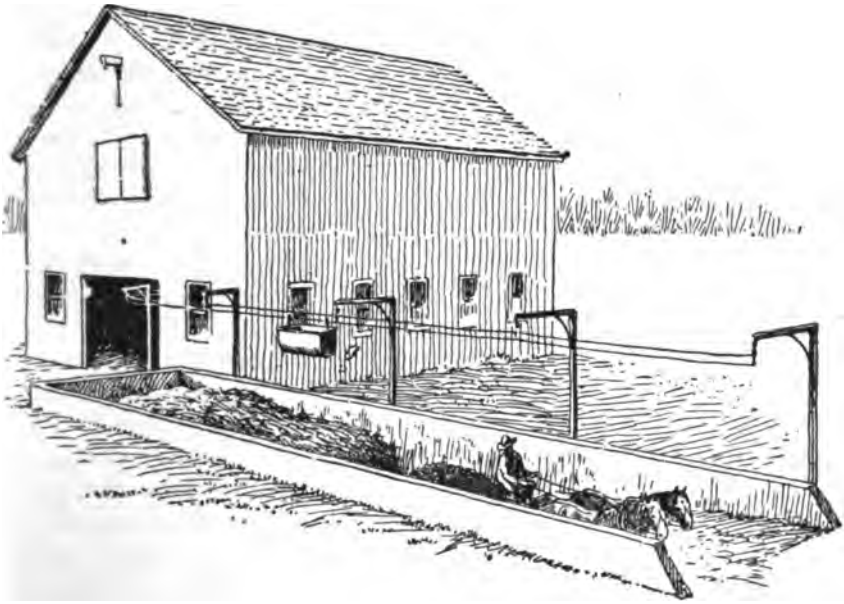

FIG. 78. AN OPEN PIT FOR STORING MANURE
The normal rainfall causes no loss of manure in a water-tight pit and the higher saturation reduces decay

of storage that permits rain water to pass thru the manure or even to displace a corresponding amount of the liquid already absorbed, results in loss. Consequently, storing manure in small, thin piles is especially wasteful. If the manure cannot be taken direct from the stable to the field and spread where the soil will absorb the leachings, it should be stored either in a pit or in a large compact pile of such form that heavy rains will be shed from the surface. In these large piles the average rainfall does not cause leaching, for it is usually offset by the intervening loss of moisture by evaporation. The occasional moderate rains during summer keep the outer layer of the manure pile moist and thereby reduce decay.

DECAY OF MANURE

The decomposition of manure may have two wasteful consequences: it destroys the organic matter; and it increases the solubility of the constituents, thereby making them more subject to loss by leaching. Decay is a slow process of burning or destroying organic matter, brought about by the innumerable forms of microorganisms in the manure heap. It has even been suggested that the voidings of some animals are made up largely of the bodies of these organisms. Such decay produces heat, as is shown by the high temperature of horse manure in heaps or in hotbeds.

The decay of any organic material is governed largely by the accessibility of air or oxygen. If the manure is moist, loose, and open, decay is rapid. If the manure is rather dense, decay is more slow. The difference in the rate of decay of manure from the horse or the sheep and that from the cow or the pig is caused by the difference in the physical character of these two types of manure (table 3). The one decays rapidly, heats up intensely, and may even reach a stage of spontaneous combustion; the other decays slowly and does not heat much. If the supply of air is inadequate after the decay process has started, it continues in the anaerobic (without air) form, which is especially destructive of the combined nitrogen. The excessive heating of manure and its change to a chaffy, whitish condition is known as fire-fanging. This process is brought about by fungi rather than by bacteria, and the whitish appearance is due to the threads, or mycelium, of the fungi. In proportion as manure is kept wet and compact, the rate of decay is reduced. Storage in large piles and the mixing of cold wet manure with that which is loose and porous, are good practices. Manure that is stored in covered yards and box stalls from a mixed lot of stock is very well preserved for these reasons. It may even be permissible to spray water on the manure heap until it is saturated, in addition to tramping it.

The increase in the solubility of manure brought about by decay is shown in table 6.

TABLE 6. EFFECT OF DECAY ON THE SOLUBILITY OF MANURE

	Percentage in fresh manure	Percentage in rotted manure
Water	66.17	75.42
Soluble organic matter	2.48	3.71
Soluble organic nitrogen	0.15	0.30
Soluble inorganic matter	1.54	1.47
Insoluble organic matter	25.76	12.82
Insoluble inorganic matter	4.05	6.58

The process of decay affects especially the nitrogen, which is largely in the form of urea, a compound that changes rapidly into volatile forms. The sharp pungent odor around manure heaps is largely due to the ammonia thus formed, which passes off into the air. Any treatment that checks the general decay process conserves the nitrogen.

Because of the volatile nature of ammonia it has been proposed to apply materials that unite with the ammonia and prevent its escape as a vapor. Any of the stronger acids will serve this purpose. Sulfuric acid is the most effective, but is impractical to handle under farm conditions. Recent investigations indicate that powdered sulfur might be used, as it is rapidly converted into sulfuric acid by bacterial processes. This material has not been tried out in practice and should be used with caution. Compounds of sulfuric acid that undergo change in contact with the ammonium carbonate of the manure, may be used. Land plaster, or gypsum ($CaSO_4$), has been suggested but proves to be of very low efficiency. Acid phosphate, which is a mixture of land plaster and monocalcium phosphate, is considerably more effective. A laboratory test of the efficiency of these materials on liquid manure that was evaporated to dryness, showed the following results:

	Percentage of nitrogen lost
Sulfuric acid	2.68
Acid phosphate	27 to 37
Land plaster	50

Raw rock phosphate and ground limestone do not conserve the ammonia except in so far as they conserve the liquid. Some farmers use a rather coarse grade of ground limestone on cement floors to prevent the animals from slipping. No caustic materials, such as quicklime, air-slaked lime, and wood ashes, should be used on manure, for their alkaline properties drive the ammonia out of the manure. Acid phosphate and land plaster are commonly sprinkled on the manure in sufficient quantity to form a good coating, or they are applied at the rate of forty to sixty pounds per ton of manure. In poultry houses a good grade of acid phosphate may be kept in boxes before the roosts so that the hens can dust themselves in it and thus spread it. The phosphate may be sprinkled over the droppings whenever the odor of ammonia is noticed.

Phosphates and lime may be used on manure for a totally different purpose, namely, to add to it constituents that are particularly needed by the soil and in which the manure is deficient. Raw rock phosphate, as well as acid phosphate, is used for this purpose. The decay of the organic matter in the manure probably increases the availability of phosphorus in the raw rock. Applying lime in the form of ground limestone to the soil in this way saves some labor.

DETERMINATIONS OF LOSS

It has been stated that there is an inevitable loss in handling manure. Figures showing the extent of this loss may serve to increase the care employed in handling it. At the Cornell University Agricultural Experiment Station[2] two tons of horse manure and five tons of cow manure were each lightly packed in a box, the latter with three hundred pounds of gypsum, and let stand exposed to the weather from the latter part of April until the first of October. The results of this experiment are given in table 7.

TABLE 7. LOSS OF MANURE IN STORAGE AT CORNELL

	Number of pounds at beginning of experiment		Number of pounds at end of experiment		Percentage of loss	
	Horse	Cow	Horse	Cow	Horse	Cow
Gross weight	4,000	10,000	1,730	5,125	57	49
Nitrogen	19.6	47	7.79	28	60	41
Phosphoric acid	14.8	32	7.79	26	47	19
Potash	36.0	48	8.65	44	76	8

The decrease in gross weight probably gives a very good indication of the loss of organic matter, which was not determined. The material underwent decay and leaching.

Shutt,[3] of the Canadian Department of Agriculture, exposed mixed manure from horses and cows in bins, both with and without shelter from the weather, for a period of one year and found the losses given in table 8.

TABLE 8. LOSS OF MANURE IN STORAGE AT CANADIAN STATION

	Percentage in protected bin	Percentage in unprotected bin
Loss of organic matter	60	69
Loss of nitrogen	23	40
Loss of phosphoric acid	4	16
Loss of potash	3	36

By far the largest part of the loss occurred in the first three months of exposure. During that time occurred ninety per cent of the total loss of

[2] The production and care of farm manures. I. P. Roberts. Cornell University Agricultural Experiment Station. Bulletin 27.

[3] Barnyard manure: its nature, functions, composition, fermentation, preservation and application. Frank T. Shutt. Canadian Department of Agriculture, Central Experimental Farm. Bulletin 31.

organic matter and seventy-five per cent of the loss of nitrogen, in both the protected and the unprotected bins. Scarcely any of the phosphoric acid and potash was lost from the sheltered bins during this period, but more than half of the total loss of those elements occurred in the bins exposed to the weather. These figures very clearly show the large loss that occurs from decay alone even without leaching. This loss falls especially heavy on the two most valuable constituents of the manure — the organic matter and the nitrogen, which are changed into volatile forms. The manure used in this experiment doubtless did not contain all the liquid corresponding to this solid material; hence the loss of nutrients, particularly nitrogen, appears smaller than it actually was.

At the Ohio Agricultural Experiment Station, manure in lots of one thousand pounds each was exposed from January to April, the period in which the loss might be expected to be least. Analyses show that the loss in five different piles averaged twenty-five per cent of the organic matter, twenty-eight per cent of the nitrogen, and twenty per cent of the ash, or mineral elements.

These figures are typical of all that have been obtained on the loss of manure in storage. They show that in a relatively short time half of the organic matter, nitrogen, and potash, and a quarter of the phosphoric acid, may be lost. The greater the loss of the liquid, and the longer the manure is exposed to decay and to leaching, the larger is the total loss.

APPLICATION OF MANURE

In general farming, the best practice is believed to be to apply the manure to the land as rapidly as it is made. The soil and the crop, if there be one, are depended on to reduce the loss to a minimum. The manure should be distributed at once and not left in small piles; the latter is the most wasteful of all methods of handling manure. The absorptive capacity of the soil for all the constituents is large. The organic matter probably suffers the largest loss. For this reason it is better to incorporate the manure with the soil immediately. The deeper it is plowed under, the slower is the rate of decay.

Large loss is likely to occur if the ground is saturated with water or covered with ice; light snow is not detrimental. Manure may be successfully applied on a moderate slope. If manure must be stored and cover is not available, it should be kept, all kinds together, in a large, compact, thoroly moist pile. The most successful gardeners store their manure in the summer in large piles four to five feet high and flat or saucer-shaped on top so as to collect the rain. A pile of this height has sufficient water capacity to absorb almost any amount of rainfall that ordinarily

occurs. This in part offsets the loss by evaporation so that the pile is kept more moist than if it were built so as to shed the rain. The latter form is best for winter storage.

The percentage of the constituents that may be saved when manure is stored in concrete pits as compared with piles, has not been accurately determined. Assuming that the difference in loss were fifteen per cent of the organic matter, nitrogen, and potash, for an animal weighing one thousand pounds this loss would amount annually to about six dollars, or sufficient to pay six per cent on one hundred dollars. On a herd of twenty animals it would warrant a capitalization of two thousand dollars for a manure pit, assuming that the labor of distribution were the same, which of course is not true. It is conceivable that the saving may be larger.

Serious disadvantages of applying manure direct from the stable to the fields are as follows: There are times when the manure cannot be put on the land, due to snow or rain or growing crops. The loss of organic matter and nitrogen from manure spread direct from the stable, while not determined, is probably considerable, and increases the desirability of storage. The manure pit is therefore likely to find a more important place on the stock farm than it has been given heretofore.

FIG. 79. CORRECT FORM OF MANURE PILE FOR SUMMER STORAGE

PLACE OF MANURE IN ROTATION

It is not easy to decide just where and how on each farm the manure may be applied to best advantage. In general, forage and vegetable crops make better use of manure than do grain crops. Organic matter and nitrogen, in which the material is rich, promote vegetative growth.

On the mixed-crop farm where grass is let stand three to four years, the use of manure as top-dressing on new seeding greatly increases not only the growth of the grass but the residue of the manure, and the roots and stubble of the grass increase the succeeding grain crops very perceptibly. At the Cornell University Agricultural Experiment Station the application of ten tons of manure per acre to grassland for two years in three increased the six-years average yield of hay two hundred and fifty per cent. Twenty tons per acre increased the yield three hundred and fifty per cent. The yield was increased from one to two and one-half and three tons, respectively.

Valuing the manure at $1.50 per ton, and the hay at $12 per ton, the value of the increased yield of hay above the cost of the manure was

$23.50 for the application of ten tons for the three-years period, and $31 for the application of twenty tons. In addition, the ten tons of manure increased the value of the three succeeding grain crops in the rotation — corn, oats, and wheat — to the amount of $34.61, and the twenty tons $45.55. The total increase in the value of the crop was $88.11 when ten tons was applied, and $136.55 when twenty tons was applied. In this rotation the manure had a gross value per ton of $4.40 when ten tons was applied, and $3.40 when twenty tons was applied.

At the Ohio Agricultural Experiment Station the value of a ton of manure as an average for all rotations in a general farming system over a period

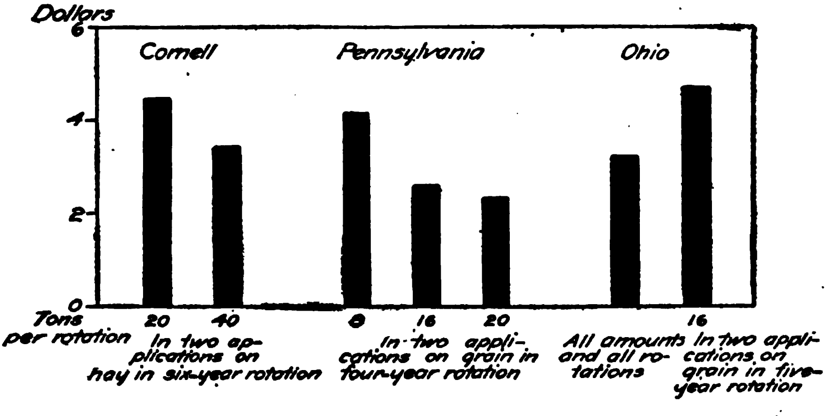

FIG. 80. THE VALUE OF A TON OF MANURE

At the Cornell Experiment Station the rotation was three years of hay followed by corn, oats, and wheat, and the manure was applied on the first and third hay crops. At Pennsylvania State College the rotation was corn, oats, wheat, and hay, and the manure was applied on the corn and the wheat. At the Ohio Experiment Station the rotation was corn, oats, wheat, clover, and timothy, and the manure was applied on the corn and the wheat. The value at which crops were calculated varied somewhat at the different stations

of years, has been about three dollars. Eight tons of manure in two applications on corn and wheat respectively in the third period of a five-years rotation of corn, oats, wheat, clover, and timothy, has a gross value of $4.69 per ton.

The farm value of a ton of manure must not be confused with the trade value of its constituents. The latter is given in table 3. The former depends on many factors — the condition of the soil, the value of the crop, the cost of applying the manure, the amount used, the cost of commercial fertilizers, and other things. In general the higher the acre value of the crop, the greater is the value of a ton of manure, assuming that it is required by the soil. Further, the smaller the acre application, the higher is the value of a ton of manure, altho the total acre value of the

increase will be less. This point is made clear in table 9, which is based on results from the Ohio Experiment Station.[4]

TABLE 9. INCREASE DUE TO A TON OF MANURE WHEN APPLIED IN DIFFERENT AMOUNTS

Number of tons of manure applied per acre	Wheat		Clover		Potatoes	
	Bushels	Valued at $1 per bushel	Pounds	Valued at $10 per ton	Bushels	Valued at 50 cents per bushel
4............	8.0	$8.00	177	$.87	37.3	$18.65
8............	4.1	4.10	150	.75	19.4	9.70
16............	2.4	2.40	99	.50	11.6	5.80

In the general farming rotation from five to ten tons per acre of manure on the non-legumes and on the more critical crops is as much as can be used on the average soil with profit. On the other hand several times these amounts may be used profitably on farm and garden vegetables.

FIG. 81. SPREADING MANURE BY HAND
The distribution is uneven, and the application must be relatively heavy to cover the ground

MANURE SPREADERS

Light applications of manure can be made effectively only by the use of manure spreaders, of which there are many types. Not only can the manure be made to go farther and to be more effective, but under favorable conditions the cost of application is reduced. The newer types of spreaders are low and hence are easier to load. The time consumed in unloading and spreading is reduced by at least half, and the distribution is much more efficient than by hand. Further — a point that is of vital importance — a ton of manure can be spread over more ground with a spreader than by hand. Five to ten tons per acre, the amounts most profitably used on

FIG. 82. SPREADING MANURE BY MACHINE
The manure spreader increases the efficiency of the manure

[4] Plans and summary tables of the experiments at the central farm, Wooster, and the northeastern test farm, Strongsville, on the maintenance of soil fertility. Ohio Agricultural Experiment Station. Circular 144.

the average mixed-crop farm, cannot be made to thoroly cover the ground by hand spreading, and therefore the efficiency of the manure is reduced.

This fact is illustrated in a general way in table 10, which was compiled by Dr. W. E. Taylor from the results of an experiment carried on by Chesney Hatch, on his farm in Newton County, Indiana.

TABLE 10. EFFICIENCY OF MANURE SPREADING WITH MACHINE AND BY HAND

Treatment	Kind of grain	Number of acres	Time planted	Amount harvested	Loads of manure per acre	Value of crop	Value of crop per acre
Manure spread with a spreader	Corn	10	May 5	620 bushels	5	$248.00	$24.80
	Oats	10	April 6	560 bushels	5	156.80	15.68
	Clover	10	April 6	30 tons	4	150.00	15.00
Manure spread by hand	Corn	10	May 4	500 bushels	5	$200.00	$20.00
	Oats	10	April 6	420 bushels	5	117.60	11.76
	Clover	10	April 6	21 tons	4	105.00	10.50
Crop raised without manure	Corn	5	May 6	200 bushels	None	$80.00	$16.00
	Oats	5	April 6	190 bushels	None	53.20	10.64
	Clover	5	April 9	7½ tons	None	37.50	7.50

TOP-DRESSING VERSUS PLOWING UNDER

The quickest effect of manure is obtained when it is applied as a top-dressing on plowed land and thoroly worked into the soil to a depth of three to five inches. Here it undergoes rapid decay and is quickly taken up by the plant roots.

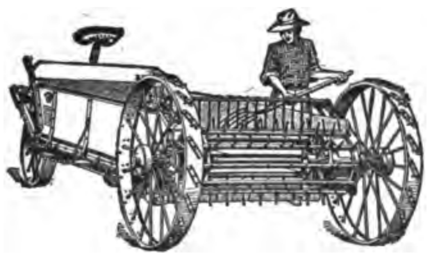

FIG. 83. A MODERN MANURE SPREADER

The most lasting effect of manure per ton is produced by relatively deep rather than relatively shallow application. When manure is plowed under, it decays more slowly and its effect is prolonged over more years than when left on the surface. This depends however on the soil and on the rotation. The same effect may be obtained from a ton of manure worked in deeper on sandy soil than on clay, and on well drained than on poorly drained land.

A good indication of the depth at which organic matter is most available and at which it ceases to be available in the soil may be gained by examining the butts of fence posts that have been in the ground for many years. They are usually most decayed about the surface of the ground and progressively less decayed toward the bottom, varying with the

ventilation of the soil. The decay of manure at different depths will be at the same rate (fig. 84).

Lack of organic matter and nitrogen are the two most immediate limiting factors of plant growth on the average soil. Since these are the primary constituents of manure, it is exceedingly important that it be conserved and applied.

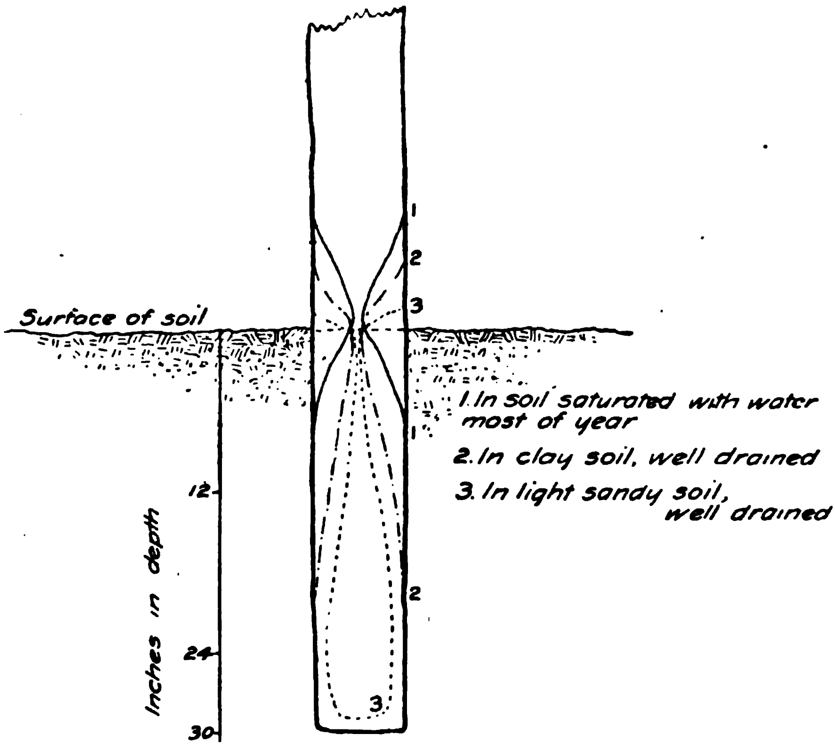

FIG. 84. THE RATE OF DECAY OF ORGANIC MATTER IN THE GROUND

Old fence posts indicate how deep manure may be plowed under. A fence post that has stood in the ground for many years undergoes decay in the part in and near the soil, and the form of the decayed end shows at what depth decay is most rapid and how deep active decay extends. To incorporate manure below that depth is to place it largely beyond reach of the roots of crops. The extent and the depth of decay depends on the fineness and the drainage of the soil

ANIMAL HUSBANDRY AND SOIL MAINTENANCE

The conservation and use of manure is primarily a problem of soil maintenance. Unless farm animals are profitable for their main products, it is doubtful economy to keep them for their manure alone. As manure is ordinarily handled, the loss is easily fifty per cent of all the constituents. When the material used by the animal is added to this, the net return to the soil from the feed is about twenty per cent of the

organic matter, from twenty to forty per cent of nitrogen, from forty to forty-five per cent of the potash, and about fifty per cent of the phosphorus.

The vital constituents are the organic matter and the nitrogen. Without animals, these can be obtained in equal amounts from one good clover crop returned to the land every five years. It is quite as practicable to haul a clover crop from a good field to a poor field as to haul all the crops to the barn, feed them, and haul back to the field an equal or larger amount of bulky, watery manure. The relative advantage depends entirely on the details of the two systems and the profits obtained.

SUMMARY

1. The animals on farms in New York produce annually about thirty million tons of manure, which is sufficient for an application of three and a half tons annually on each acre of tilled land in the State.

2. The chief valuable constituents of manure are organic matter, nitrogen, phosphoric acid, and potash. The effects of these on the soil are many and have to do vitally with the physical conditions of the soil and its supply of available plant-food.

3. Animals divert for their own use nearly two-thirds of the organic matter in the food consumed, from one-fourth to one-half of the nitrogen and phosphorus, and from one-tenth to one-fifth of the potash. Dairy cows and hens divert a larger proportion of these constituents than do other farm animals because of the nature of their products.

4. The total amount of manure produced annually per thousand pounds of live weight of the farm animals varies from five tons for the hen to about fifteen tons for the pig. This difference is primarily in the amount of water incorporated in the manure. The amount of dry matter in the manure, like the amount of food consumed, is very similar for all animals; it averages about 4500 pounds. The proportion of urine to dung varies from about 30 per cent for the horse to about 67 per cent for the pig.

5. The urine has a higher value per ton than the dung, due to its larger content of nitrogen. Its annual value however is only about one-half that of the dung.

6. The amount of plant nutrients in the manure produced annually per thousand pounds of live weight varies from 114 to 136 pounds of nitrogen, from 40 to 80 pounds of phosphoric acid, and from 90 to 126 pounds of potash. The amounts contained in a ton of manure made up of a mixture of all the urine and all the dung are 10 to 26 pounds of nitrogen, 3 to 15 pounds of phosphoric acid, and 9 to 18 pounds of potash.

7. The plant nutrients in the manure per year per thousand pounds of live weight have a commercial value at the price of the nutrients

used of about twenty-seven dollars, and the organic matter has a value of about nine dollars, making a total value of about thirty-six dollars per year. The range in commercial value per ton of manure — urine and dung — is from $2.30 for the pig to $7.25 for the hen. The commercial value per ton of air-dried material is about fourteen dollars for all animals except the cow, for which it is about eleven dollars.

8. Manure undergoes loss by decay, by leaching, and by failure to conserve the liquid manure. This loss may be very large where little or no care is taken to save the material. Investigation indicates that by the ordinary method of storage in rough yard piles the loss in three months is more than half of the organic matter, nitrogen, and potash.

9. Manure may be conserved either by proper storage or by spreading it on the soil as fast as it is made. Probably not over three-fourths of the manure produced can be utilized by the best possible method of handling, and the proportion may be as low as one-fourth.

10. Manure is best stored in large compact piles or in watertight pits, so that the liquid will be absorbed by litter and decay prevented.

11. The nitrogen and the organic matter are lost by decay and by passing off as vapor even without exposure to rain or leaching.

12. Acid phosphate is the best practicable amendment to use with manure to conserve the ammonia. Land plaster is relatively inefficient. Limestone and raw rock phosphate have no conserving effect except as absorbents. Any caustic material, such as lime or ashes, should never be applied to manure.

13. Forage and vegetable crops make the best use of manure. Light applications produce better returns per ton than heavy applications. For general farm crops, five to ten tons should be used per acre. The application should also be gauged by the value of the crop. The use of manure as top-dressing on new grass seeding is good practice.

14. The largest and quickest results from manure are obtained by using it as top-dressing on plowed land and immediately and thoroly incorporating it with the soil. Plowing under manure conserves the organic matter and is likely to increase the total effect.

15. Manure spreaders are essential for the most efficient and economical use of manure on the general farm.

16. Wasteful handling of the manure may make animal husbandry more destructive of soil fertility than is careful farming without stock. The net return to the soil in the manure of the constituents in the food consumed by an animal, is never over thirty per cent of the organic matter and sixty per cent of the nitrogen and potash, and it may be as low as ten per cent of the organic matter and twenty per cent of the nitrogen and mineral constituents.

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 141 — THE SOIL SERIES — JANUARY, 1919

FARM MANURE

ITS PRODUCTION, CONSERVATION, AND USE

DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

The available reading course lessons for the farm are arranged in series on the following subjects: THE SOIL, FARM CROPS, LIVESTOCK, DAIRYING, FRUIT GROWING, THE HORSE, POULTRY, VEGETABLE GARDENING, FLOWER GROWING, BEEKEEPING, PLANT BREEDING, FARM FORESTRY, COUNTRY LIFE. New readers may enroll in one or more of these subjects. The first lesson in the series is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. The reader may register for The Soil Series by signing and returning this discussion paper. The space below on this page is reserved for registration in other series, and also for names and addresses of residents of New York State likely to become interested in the reading course.

(*Detach, sign, and return for the next lesson in this series.*)

(In answering questions, attach additional paper if needed and number the answers.)

1. How much manure is produced on your farm annually from each type of animal?

2. What part of this manure is actually saved and put on the land in such a way that it is effective in the production of larger crops?

3. What are the important constituents of manure?

4. What part of each of these constituents in the feed is regained in the manure?

5. How much manure will a thousand pounds live weight of each of the following animals produce annually in total: horse, cow, pig, sheep, hen?

6. What are the effects of manure on the soil?

7. What is the value of a ton of manure on your soil and on the crops there produced?

8. What methods are in use in your region for the conservation of manure?

9. Where in the rotation do you find that it pays best to apply manure?

10. What method of handling manure seems to be most profitable in your region: storage or direct application; before plowing or after plowing; plowing under deep or shallow; distribution by hand or with spreader?

11. What is the character of your soil?

12. Do you know of any one who is storing liquid manure in a cistern? How is it applied to the land? With what results?

Name...

Address..

Date...

(*Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.*)

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
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LESSON 142 FARM MANAGEMENT SERIES FEBRUARY, 1919

CALCULATING THE COST OF MILK PRODUCTION

E. G. MISNER

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

THE CORNELL READING COURSE FOR THE FARM

SUPERVISOR
ROYAL GILKEY

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BRISTOW ADAMS
RUTH VAN DEMAN

"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture."— ABRAHAM LINCOLN.

The increased area for world food production in 1919 indicates that New York farmers should return to sound permanent systems of farming. The combination of cultivated thought with labor not only is agreeable but results in efficiency in farming, which makes profits possible when price levels are becoming lower. The State College of Agriculture offers lessons for home study free to residents of New York State. The reader may obtain consecutive instruction on the subjects in which he is interested, and also the new lessons as issued. The attached discussion paper gives further information.

The reading-course lessons for the farm are elementary and brief, and are intended to arouse a desire for additional knowledge. Advanced reading courses in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods. Reports on the reading and practical exercises are corrected, graded, and returned to the reader with suggestions from specialists. The only expense in each advanced reading course is the cost of a textbook and practice material.

The reading-course lessons make useful material for educational programs in granges and other local organizations. In a number of communities groups have organized for the discussion and study of common problems, and have adopted the name *Cornell Study Club*. This may be done in connection with an existing organization or independently. Assistance is given in organizing and conducting Cornell study clubs.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

CALCULATING THE COST OF MILK PRODUCTION

E. G. Misner

A fairly uniform method of studying and reporting the cost of producing milk is needed. This publication outlines a simple method for calculating the cost of milk and for classifying and arranging the various cost items, and contains blank forms for summarizing these costs. From time to time and in different regions minor changes may need to be made. These blanks are designed for farmers who desire to calculate and study the cost of producing milk on their own farms; they are not intended to serve the purposes of the investigator. The Department of Farm Management of this College has other blanks for that purpose, but they are necessarily too complicated for general use by extension workers or by farmers. Nor are the blanks in this publication designed for keeping an account with cows; they are arranged so that the farmer may summarize the yearly cost, using all the records that he has and making necessary estimates.

CHARGE AND CREDIT FACTORS IN COMPUTING THE COST OF MILK PRODUCTION

Various methods have been used in calculating the cost of milk production. One way has been to consider the farm as a milk factory, and any products other than milk, such as potatoes or hay sold, as by-products incidental to milk production. Receipts from such products were deducted from the total cost of operating the farm, and the difference was considered the cost of producing milk. This method attributes all the profits or the losses of the farm to milk production, which is very misleading if many other products are sold.

Another method of calculating the cost of producing milk has been to consider not the farm but the entire dairy herd as the unit of study. The feed, labor, and other costs of maintaining the whole herd are then charged to milk production, and the increased value of the young cattle, the manure, and the other returns are credited. The difference is the herd cost of producing milk. An unusual number of young cattle raised in any particular year so influences the amounts of feed and labor used per cow or per hundred pounds of milk, which are the important factors in analyzing the economy of milk production on a particular farm, that these amounts cannot be compared with a year when fewer young cattle are raised on the same farm. Nor can farms be satisfactorily compared

one with another, because of the variation in the number of young cattle kept. But since in most cases heifers are valued at about what it costs to raise them, the herd cost of milk is practically identical with the cow cost.

The most satisfactory way of calculating cost of milk production is to include cows only. All costs for young cattle or herd bulls are then kept separate. Cows are charged with bull service at cost, and heifers calving for the first time are charged to cows at their value just before freshening, which, on the average, is approximately their cost. Practically all persons who have given much attention to the cost of producing milk use this method.

The various charges to cows may be grouped as follows: feed, bedding, labor, use of buildings, use of equipment, depreciation, interest, bull service, and miscellaneous.

The credits include milk sold, milk and its products used on the farm and milk products sold, calves and calf hides, manure, and miscellaneous returns.

The cost of milk sold is found by deducting the credits, except milk sold, from the charges.

CHARGES OR COSTS

FEED

GRAIN AND OTHER CONCENTRATES

The kinds, the number of pounds, the price, and the total cost of the grain feed used by cows during the pasture period and the winter period should be entered in table 1. If a record of feed purchased is kept, the amount used by cows may be found by deducting from the total the estimated amount used by young cattle, herd bulls, and other stock. If no record of the feed purchased is kept, a close estimate can be made of that used by cows. For convenience in making the estimates, the year should begin at the beginning or the end of the pasture period. Grain produced on the farm should be charged at its farm value, which is the market price less the cost of marketing it if sold. If grain is of inferior quality, allowance should be made for that in the charge. Grain purchased should be charged at the price paid. Cash paid for hauling feed should be charged under miscellaneous costs, but freight on feed should be included in the cost of the feed. Wet brewers' grains should be reduced to their dry equivalent by considering 3.8 pounds of wet grains equal to 1 pound of dried grains. The weight of a gallon of molasses may be considered as 10.5 pounds.

TABLE 1. GRAIN AND OTHER CONCENTRATES USED BY COWS

Kind of feed	Pasture period			Winter period		
	Pounds	Price	Value	Pounds	Price	Value
HOME-GROWN						
Corn		$	$		$	$
Oats						
Buckwheat						
PURCHASED						
Over 25 per cent protein						
Gluten						
Distillers' grains						
Brewers' grains						
Cottonseed meal						
Oilmeal						
12–25 per cent protein						
Wheat feed						
Wheat bran						
Wheat middlings						
Less than 12 per cent protein						
Cornmeal						
Hominy						
Total grain and other concentrates used by cows		$	$		$	$

Total for year.............. Pounds .... Value $..............................

Average price of all grain and other concentrates per ton $...............

With the present high prices and the uncertain supply of dairy feeds, which feed to buy is an important question. Dairymen are urged to keep a careful record of the total amount and cost of every kind of feed

TABLE 2. SILAGE AND OTHER SUCCULENT FEED USED BY COWS

	Pasture period			Winter period		
	Tons	Price	Value	Tons	Price	Value
Corn silage		$	$		$	$
Corn (green)						
Mangels						
Turnips						
Beets						
Potatoes						
Oats and peas (green)						
Cabbage						
Total succulent feed used by cows		$	$		$	$
Total for year	Tons			Value $		

purchased during the year. If purchases are made at many different times, the pages of the book in which the record is kept may be ruled up and down into several spaces. The name of the feed may be written at

the top of every two columns, one for the pounds and the other for the cost. If, whenever feed is purchased, the amount and the cost of each kind are recorded in the proper columns, the total amount and cost of each feed bought can be quickly found by adding the columns at the end of the year. Careful study of such a record may help in choosing concentrates more wisely the succeeding year.

Grain fed to bulls or to young cattle should not be included in table 1. If table 9 (page 211) is filled in before table 1, a more accurate feed record may be obtained.

SILAGE AND OTHER SUCCULENT FEED

The kinds, the number of tons, and the value of all feeds with a very high percentage of water should be entered in table 2.

The amount of silage used by the herd during the year can be computed by the use of table 21 (page 223). The amount used by cows may be found by deducting that used by other stock from the amount used by the whole herd. Silage should be charged at its cost of production. In case the cost of production is not known from accounts, it may be carefully estimated by the use of table 20 (pages 221-222). Under some conditions the market value should be used; but generally in New York the corn for the silo is not raised to sell either as grain or as silage, and hence it should be charged at cost.

Other succulent feeds, such as mangels, turnips, beets, cabbage, cabbage fodder, green corn, and soiling crops, should be charged at their farm value. In most cases the quantities of these crops used will have to be estimated as carefully as possible.

HAY AND OTHER DRY FORAGE

The amount of hay, corn stover, and other dry forage fed to cows should be estimated by making proper allowance for that used by other stock and should be charged at its farm value. If the quality of hay is very poor, particular care should be used in estimating its value. A rule that will assist in calculating the amount of hay used is given on page 222.

PASTURE

The charge to cows for the use of pasture should be at cost and may be calculated by the use of table 4 (page 205). The cost of pasturing all stock should be calculated, and the charge to cows determined in the proportion which they represent of the farmer's own stock pastured for the entire season. If enough pasture is rented in the community to establish a price, or rental value, this figure may be used instead of the cost. Usually the two are about the same. If new pasture fences are built during the

TABLE 3. HAY AND OTHER DRY FORAGE USED BY COWS

	Pasture period			Winter period		
	Tons	Price	Value	Tons	Price	Value
Alfalfa hay		$	$		$	$
Clover hay						
Timothy hay						
Mixed hay						
Millet hay						
Oat hay						
Corn stover						
Bean fodder						
Oat straw fed						
Other straw fed						
Total dry forage used by cows		$	$		$	$

Total for year. . . . . Tons .... Value $....................

year, or if land is cleared for pasture so that these charges are unusually large, allowance should be made so that this year carries only its share of the cost.

Manure produced on the pasture should not be charged to the pasture, nor should it be credited to cows when finding the amount of manure recovered (page 216).

TABLE 4. PASTURE USED BY STOCK

Pasture begins.......... ends.......... Days..........

Number of acres pastured.......... Average value per acre $.......... Total value $..........

(Do not include acreage rented, for which charge is included below)

Cost items	Amount	Price	Value
Interest at ....per cent on value of pasture land	X	X	$........
Taxes	X	X	$........
Pasture rented	..........acres	$........	....
Charge for pasturing meadows	..........acres	....	....
Posts	....	....	....
Barbed wire	....	....	....
Woven wire	....	....	....
Staples	..........pounds	....	....
Seed	..........pounds	....	....
Lime	..........tons	....	....
Fertilizer	..........tons	....	....
Manure hauled and applied	..........tons	....	....
Human labor			
Making and repairing pasture fences	..........hours	....	....
Mowing, reseeding, fertilizing, and manuring pastures	..........hours	....	....
Other human labor	..........hours	....	....
Horse labor			
Making and repairing pasture fences	..........hours	....	....
Mowing, reseeding, fertilizing, and manuring pastures	..........hours	....	....
Other horse labor	..........hours	....	....
Other costs	....	....	....
Total cost	X	X	$........
Amount received for use of pasture	X	X	$........
Difference equals net cost of pasturing all stock	X	X	$........
Deduct the amount chargeable to stock other than cows	X	X	$........
Amount chargeable to cows	X	X	$........

BEDDING

The charge for bedding should include that furnished by the farm at its farm value, and also purchased bedding at cost.

TABLE 5. BEDDING USED BY COWS

	Amount	Price	Value
Oat straw		$	$
Barley straw			
Buckwheat straw			
Wheat straw			
Rye straw			
Shavings			
Sawdust			
Total bedding used by cows		$	$

LABOR

If daily records of the human and the horse time in caring for cows are not kept, the average hours per day should be carefully estimated and this figure multiplied by the number of days spent in the various kinds of work for cows, as listed in table 6. Care should be taken to include all labor by men, women, and children, chargeable to cows or to milk production. Time spent in caring for heifers and herd bulls or in hauling manure to the fields should not be included. In all cases labor in hauling milk should be reported separately from other kinds of labor.

In finding the charge for labor, the cost of labor per hour worked, if known, should be multiplied by the number of hours. Usually, however, a rate must be estimated, because few labor accounts are kept. As woman and child time usually is not so valuable as the time of men, the labor rate should take account of this fact. The labor charge should include the labor of hired men at cost. In case of unmarried men this includes wages, board, and other things furnished; and in the case of married men, wages, board, rent, fuel, farm products, and other things furnished. Farm operators could ordinarily hire out to operate farms at better than hired men's wages; their time therefore should be counted at a higher rate.

Horses will be used in many kinds of labor for cows other than in hauling the milk. Like human labor, horse labor should be charged at the cost per hour worked, if known; otherwise it should be charged at a carefully estimated rate.

TABLE 6. LABOR FOR COWS

Human labor charged at .... cents per hour

Horse labor charged at .... cents per hour

	Pasture period			Winter period			Total	
	Hours per day	Days	Total hours	Hours per day	Days	Total hours	Hours	Cost
HUMAN LABOR								
Milking............	....	....	....	....	....	....	....	$........
Man.............	....	....	....	....	....	....	....	....
Woman or child...	....	....	....	....	....	....	....	....
Other chores, such as feeding, and care of barns, cows, product, utensils, and the like.........	....	....	....	....	....	....	....	....
Hauling milk.......	....	....	....	....	....	....	....	....
* Other human labor.	....	....	....	....	....	....	....	....
Total human labor..	X	X	....	X	X	....	....	$........
HORSE LABOR								
Hauling milk.......	....	....	....	....	....	....	....	$........
Hauling feed and bedding..........	....	....	....	....	....	....	....	....
Other horse labor....	....	....	....	....	....	....	....	....
Total horse labor....	X	X	....	X	X	....	....	$........

* Include time spent in hauling feed, hauling bedding, hauling or carrying water, hauling sawdust for ice, harvesting and storing ice, buying and selling cows and feed and supplies, taking cows to breed, cleaning and whitewashing barn, herding, mixing feed, testing and accounting, and other work for cows not included elsewhere.

USE OF BUILDINGS

The charge to cows for the use of buildings should be determined on the basis of their share of the various items of building costs. If the building also houses other stock, crops, or equipment, the cows should be charged with only their proportion of the total cost of the upkeep of the building. If forage is charged at its value when stored at the barn, the price includes the charge for storage; therefore portions of the barn used in storing hay for cows should not be included. As in the case of pasture, it will

be found more convenient to calculate the charge for the use of buildings occupied by all cattle and then to deduct a share for young cattle and herd bulls, in order to determine the amount chargeable to cows.

TABLE 7. BUILDINGS USED FOR CATTLE

	Value at the beginning of the year	Value at the end of the year
Dairy cattle barns and yards, and buildings for storing equipment used for cattle	$	$
Milk house		
Ice house		
Share of pump house		
Total	$	$
Average value	X	$

Costs	Amount	Price	Value
Interest at ......per cent on average value	X	X	$
Insurance	X	X	
Taxes	X	X	
Decreased value	X	X	
Purchased lumber			
Shingles			
Roofing			
Hardware			
Paint			
Glass			
Sand			
Gravel			
Cement			
Stanchions			
Wire netting			
Materials from farm			
Labor hired for building work, such as carpenter, painter, or mason			
Board of this labor			
Farm labor			
Horse labor			
Other costs			
Total	X	X	$
Less increased value, if any	X	X	$
Total charge for use of buildings	X	X	$
Deduct amount chargeable to other stock	X	X	$
Amount chargeable to cows	X	X	$

Carefully kept cost accounts show that the annual upkeep of buildings, including taxes and insurance, usually costs from four to five per cent of the average value in addition to interest. In order to abbreviate this

work, the charge for the use of buildings may be considered to be about ten per cent of the value of the buildings occupied by cows and used in handling the milk, but a more accurate figure will be obtained by using the form given in table 7. The charge for use of buildings includes interest on the average value, insurance, taxes, new buildings and repairs, and decreased value if any, less any increase in value. If the year's labor and cash outlay on buildings has not been sufficient to maintain the value, it should be decreased. If more than enough to maintain this value has been done, it should be increased at the end of the year.

USE OF EQUIPMENT

The dairy equipment and most of the tools in cattle barns are used largely for cows. Therefore, only the cows' share of the equipment used need be inventoried here, as it is practically all chargeable to them. If, for convenience, equipment used by heifers or herd bulls is inventoried or charged to cows, a deduction should be made for such use by heifers and bulls when calculating the amount chargeable to cows. The charge for use of equipment includes interest on the average value, cost of equipment purchased, repairs, and decreased value, less increased value and equipment sold. A form for computing this charge is given in table 8.

DEPRECIATION ON COWS

Depreciation on cows should be calculated as follows: To the value of the cows at the beginning of the record year, add the value just before freshening of heifers calving during the year for the first time and the cost of cows purchased during the year. Deduct receipts from cows sold, value of cows slaughtered, value of cow hides sold or on hand, and value of cows at the end of the record year. Appreciation because of a rising price of cows, or depreciation because of a falling price of cows, should not be included. Such market fluctuations should be omitted in calculating the cost of milk production because they are not repeated annually, but the influence that such appreciation or depreciation would have on the cost of milk may be calculated separately. Of course, if the herd is young and is becoming more valuable, an increase in value is justified, because the cows are nearer the age of maximum worth at the end than at the beginning of the year.

In finding the value of the herd at the beginning of the year, for the purpose of calculating depreciation and also interest on the investment in cows, the total number of cows multiplied by the average value per head may be used. If more detail is desired, each cow may be listed individually. Depreciation on cows may be calculated in terms of percentage of their average value, as well as in dollars.

TABLE 8. EQUIPMENT USED FOR COWS

	Value at the beginning of the year	Value at the end of the year	Purchased		Cost of repairs
			Amount	Value	
Cans	$	$		$	$
Coolers					
Tester, bottles, and the like					
Milk or feed scales					
Separator					
Churn and butter worker					
Milk pails and strainers					
Milking machine					
Milk wagons					
Share of farm automobile					
Boilers					
Gasoline or steam engines					
Feed grinders					
Water pumps, tanks, and heaters					
Share of other water system					
Share of lighting system					
Ice tools					
Feed trucks and litter carriers					
Wheelbarrows					
Clipping machine					
Whitewashing outfit					
Milking tubes; milk-fever and other veterinary outfits					
Baskets, brooms, forks, and shovels					
Sprayers					
Curry combs and brushes					
Rope and halters					
Lanterns, wash basins, and thermometers					
Milking stools					
Labor, man (hours)	X	X	X	X	
horse (hours)	X	X	X	X	
Other items					
Total	$	$	X	$	$

Average value of equipment $..................

Interest at ....per cent on this value	$	
Equipment purchased	$	
Repairs on equipment	$	
Decreased value	$	
Total		$
Increased value	$	
Equipment sold	$	
Total		$
Difference equals charge for use of equipment		$

FIG. 85. HOLSTEIN COW GLISTA ERNESTINE, BRED AND OWNED BY CORNELL UNIVERSITY

Record, 7 days { Fat, 28.78 lbs. Milk 823.05 lbs. 30 days, Fat 119.8 lbs. 100 days, Milk 10,227.1 lbs. Year { Fat 833.7 lbs. Milk 23,341.0 lbs.

TABLE 9. DEPRECIATION ON COWS

	Number	Price	Value		Number	Price	Value
Cows on hand at the beginning of the year........	....	$........	$........	Cows on hand at the end of the year...........	....	$........	$........
Cows purchased...	....	....	....	Cows slaughtered or sold.........	....	....	....
Heifers that became cows*..........	....	....	....	Cows that died...	....	Hides and carcasses	....
Total**.......	....	X	$........	Total**......	....	X	$........

Appreciation $.................... (if right total exceeds left total)

Depreciation $.................... (if left total exceeds right total)

* For heifers that calved during the year for the first time, use their value at the time of freshening.
** If the numbers are correct, the totals of the two number columns will be equal.

INTEREST

Separate interest charges should be made (1) on the average value of cows at the beginning and at the end of the year and (2) on the average value of feed and supplies kept on hand for cows. In other cases interest has been included in determining the charge for the item under use of

buildings, use of equipment, and use of pasture. The average value of feed and supplies kept on hand for cows should include, as nearly as it is possible to determine, the average investment in concentrates used by cows from the time paid for until fed, the average value of silage, hay, other roughage, and bedding from the time stored until fed, and the average value of miscellaneous supplies kept for cows. The prevailing interest rate in the community on short-time loans should be used. In 1918 in most dairy regions of New York State this was six per cent.

TABLE 10. INTEREST ON COWS AND ON FEED AND SUPPLIES KEPT FOR COWS

		Interest at .... per cent on this value
Average value of cows on hand at beginning of year and at end of year	$........	$........
Average value of feed and supplies kept on hand for cows	$........	$........

BULL SERVICE

The cost of keeping herd bulls and calves that are to be kept for herd bulls, and cash paid for service, should be charged to cows as bull service. This may be very closely estimated by carefully following table 11. If heifers are bred, their share of the cost of service becomes a part of the cost of raising the heifers, and a deduction from the cost of bull service should be made when calculating the charge for cows.

TABLE 11. BULL SERVICE

Appreciation or depreciation on herd bulls			
	Number	Price	Value
Herd bulls on hand at beginning of year	....	$........	$........
Herd bulls purchased during year	....	....	....
Bull calf to be kept, born during year (value at birth)	....	....	....
1. Total	....	$........	$........
Herd bulls slaughtered or sold	....	....	....
Bull hides	....	....	....
Herd bulls on hand at end of year	....	....	....
2. Total	....	$........	$........
Appreciation, if second total exceeds first total (enter below)	X	X	$........
Depreciation, if first total exceeds second total (enter below)	X	X	$........

TABLE 11 (*concluded*)

Summary of herd bull costs

	Amount	Price	Value
Costs			
Whole milk	......pounds	$......	$......
Skimmilk	......pounds	......	......
Calf meal	......pounds	......	......
Grain	......pounds	......	......
Silage	......tons	......	......
Other succulent feed	......tons	......	......
Dry forage	......tons	......	......
Pasture	......days	......	......
Bedding	......tons	......	......
Human labor	......hours	......	......
Horse labor	......hours	......	......
Use of buildings	......	......	......
Use of equipment	......	......	......
Interest on bulls	......	......	......
Interest on feed and supplies	......	......	......
Depreciation (from above)	......	......	......
Miscellaneous charges	......	......	......
Service fees	......	......	......
Total costs	X	X	$......
Returns			
Appreciation (from above)	......	$......	$......
Manure recovered	......tons	......	......
Received for service	......	......	......
Total returns	X	X	$......
Difference equals net cost of bull service	X	X	$......
Amount chargeable to cows	X	X	$......

MISCELLANEOUS CHARGES

In many cases some of the miscellaneous costs in milk production are overlooked. All items should be included, but only that part of the expense chargeable to cows should be recorded. If a cash account is kept, many of these expenses may be transferred for summary to table 12.

TABLE 12. MISCELLANEOUS CHARGES TO COWS

	Total	
	Amount	Value
Cash paid for hauling milk	......	$......
Insurance on cows	......	......
Taxes on cows, if any	......	......
Condimental feeds	......	......
Salt	......	......

TABLE 12 (*concluded*)

	Total	
	Amount	Value
Vaseline, salves, salts, and other medicines		$
Disinfectants		
Tuberculin testing		
Dehorning		
Veterinary fees		
Louse killers		
Fly killers		
Lime		
Kerosene		
Carbide		
Electric lights		
Gasoline		
Oil		
Batteries for engines		
Fuel for water heater		
Fuel for dairy		
Soap and cleaning powders		
Muslin for windows, towels, suits, and strainer cloths		
Acid		
Testing dues		
Board of tester		
Board of tester's horse		
Board of cow buyers		
Freight or express on cows		
Feed grinding		
Charges for hauling feed, bedding, ice, or sawdust for ice		
Charges for ice		
Sawdust for ice		
Association dues		
Dairy papers		
Postage		
Stationery		
Printing and advertising		
Herd books or other records		
Registration fees		
Transfer fees		
Commissions, affidavits, and shipping tags		
Railroad fares		
Telephone		
Telegrams		
Weighing		
Other costs		
Total	X	$

CREDITS OR RETURNS, OTHER THAN MILK SOLD

The credits to be made in computing the cost of milk sold are for milk and its products used on the farm, and milk products sold; calves and calf hides; manure; and miscellaneous returns.

MILK AND ITS PRODUCTS USED ON THE FARM, AND MILK PRODUCTS SOLD

The amount of the milk used by the family of the farmer and of the hired man, and by calves and other stock, should be credited at the value on the farm. If butter is made, the butter, the skimmilk, and the buttermilk should also be credited to cows, whether sold or used on the farm. Cream, cheese, and other milk products sold should be credited at the prices received. If milk is retailed, the amount so disposed of and the receipts from it should be kept separate from milk sold wholesale.

TABLE 13. MILK AND ITS PRODUCTS USED ON THE FARM

	Whole milk		Skimmilk		Buttermilk		Butter		Cream	
	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value	Pounds	Value
Heifers		$		$		$	X	X	X	X
Veals							X	X	X	X
Other calves							X	X	X	X
Poultry							X	X	X	X
Hogs							X	X	X	X
Operator's family								$		$
Hired man's family										
Total		$		$		$		$		$

Total value of milk and its products used on the farm . . . . $

Butter sold	Pounds	Price $	Value $
Cream sold	Pounds	Price	Value
Other milk products sold	Pounds	Price	Value
Milk retailed	Pounds	Price	Value

Total value of milk and its products used on the farm, and of milk products sold . . . . $

Equivalent in pounds of milk* . . . . Pounds

* To obtain this figure add the pounds of skimmilk, butter, and cream to the pounds of whole milk.

CALVES AND CALF HIDES

Cows should be credited with the value at birth of calves born during the year. If calves are born dead or are deaconed, the value of the hides and carcasses will be the figure entered. If the calves are sold when two or three days old, the price received may be used.

TABLE 14. CALVES AND CALF HIDES

	Number	Value per head at birth	Total value
Heifers		$	$
Bulls to be kept			
Bulls to be sold			
Calves vealed			
Calves deaconed		X	X
Hides of calves deaconed		X	$
Calves born dead		X	X
Hides of calves born dead		X	$
Total credited to cows for calves and calf hides	X	X	$

MANURE

Cows should be credited with their share of the manure recovered for use on crop land. The amount may be estimated from the number of loads, and a deduction made for young cattle and other stock. Manure left on the pasture should not be credited because the pasture is not charged with it.

The value placed on manure should be its value at the barn, not its value after it is hauled to the field. Hence the cost of hauling and spreading should not be included.

TABLE 15. MANURE

Manure recovered from cows for use on crop land or hauled and applied to pasture .... Tons	Value at barn per ton .... $	Total value...... $

MISCELLANEOUS RETURNS

Feed bags, money received for boarding cows, indemnities for cows killed on the railroad or by lightning, and other miscellaneous returns from cows, should be included as credits.

TABLE 16. MISCELLANEOUS RETURNS

	Amount	Price	Value
Feed bags		$	$
Received for board of cows			
Received for cows killed by accident			
Other miscellaneous returns			
Total	X	X	$

COST OF PRODUCING MILK SOLD WHOLESALE

The various items of costs and returns should be brought forward and summarized in table 17. The cost of producing milk sold wholesale may be found by deducting the total returns other than milk sold wholesale from the total costs. In some cases failures of companies buying milk are responsible for large losses to dairymen. Also a temporary loss of market sometimes occurs. Therefore it is possible that a charge for risk of business should be included, but no such charge has been included in this method of calculating the cost of milk production. The charge in many cases made for managerial ability and supervision should be covered by the higher rate at which the operator's labor is charged.

GAIN OR LOSS ON MILK SOLD WHOLESALE

The difference between the receipts for milk sold wholesale and the cost of milk sold will equal the profit or the loss on cows. Each dairyman should keep his monthly milk stubs so that at the end of the year he can transfer figures from them to the form given in table 18. He can then summarize completely the account with cows and calculate the profit or the loss on them.

TABLE 17. SUMMARY OF COSTS, AND RETURNS OTHER THAN MILK SOLD

	From page	Amount		Value	
		Total	Per cow	Total	Per cow
COSTS					
Grain and other concentrates..........	201	............pounds	............pounds	$............	$............
Silage and other succulent feed........	202	............tons	............pounds	....	....
Hay and other dry forage............	204	............tons	............pounds	....	....
Total feed except pasture.......	......	X	X	$............	$............
Pasture............	205	....	....	....	....
Bedding............	206	....	....	....	....
Human labor.......	207	............hours	............hours	....	....
Horse labor.........	207	............hours	............hours	....	....
Use of buildings.....	208	....	....	....	....
Use of equipment....	210	....	....	....	....
Depreciation on cows	211	............per cent	....	....	....
Interest on cows.....	212	....	....	....	....
Interest on feed and supplies..........	212	....	....	....	....
Bull service.........	212	....	....	....	....
Miscellaneous charges	213	....	....	....	....
Total costs.....	......	X	X	$............	$............
RETURNS OTHER THAN MILK SOLD WHOLESALE					
Milk and its products used on the farm, and milk products sold	215	............pounds	............pounds	$............	$............
Calves and calf hides.	216	............number	............number	....	....
Manure............	216	............tons	............tons	....	....
Miscellaneous returns	217	X	X	....	....
Total returns other than milk sold wholesale.......	......	....	....	....	$............
DIFFERENCE EQUALS COST OF MILK SOLD AND DELIVERED AT STATION*..........	......	X	X	$............	*Per 100 pounds $............

*The amount of milk sold wholesale must be found from table 18, before calculating the cost per 100 pounds.

TABLE 18. MILK SOLD WHOLESALE

Milk sold to at

*Month	Pounds of milk	Percentage of fat in milk	**Pounds of fat in milk	Price	Value
				$	$
Total milk sold wholesale				$	$

Cost of milk sold wholesale (from page 218) .... $

Difference equals gain or loss on milk sold wholesale .... $

Gain or loss per 100 pounds .... $

* The twelve months should be same as those used in finding the cost of production.
** Multiply the number of pounds of milk by the percentage of fat to find the number of pounds of fat in milk.

STUDYING THE RECORD

The most important use of a record of this kind to the farmer is not the finding of the actual cost of milk production, but the information and suggestions that he may get by a careful study of factors that will show him how efficiently his dairy enterprise is being conducted. Thru investigations on the cost of producing milk, data have been gathered so that the individual farmer may now compare some points of his business with averages.

TABLE 19. FACTORS FOR STUDYING THE RECORD*

State County Year ending City for which milk was produced	New York Broome May 1, 1915 New York and Binghamton (summer dairies)	New York Broome May 1, 1915 New York and Binghamton (winter dairies)	Investigations in Michigan, New York, Connecticut, and New Jersey	Your farm
Number of farms	41	56	444	....
Number of cows	503	798	8,810	....
Size of business				
1. Number of cows per farm	12.3	14.2	19.8	....
2. Hundredweight of milk produced per farm	645	830	1,283	....
Labor				
3. Hours of human labor in milk hauling per cow	23	16	195.8	....
4. Hours of other human labor per cow	163	183		....
5. Total human hours per hundred pounds of milk produced				
Pasture period	2.44	2.84	....	....
Winter period	5.16	3.77	....	....
Year	3.54	3.42	3.02	....
6. Hours of horse labor per cow	39.1	29.8	45.3	....
Season of production				
7. Per cent of milk produced in six months				
April-September	71	48	50.3	....
October-March	29	52	49.7	....
Production				
8. Pounds of milk produced per cow	5,255	5,822	6,481	....
9. Test of milk	4.1	4.0	3.8	....
10. Pounds of butterfat produced per cow	215	234	244	....
Feeding				
Per 100 pounds of milk in year				
11. Grain and other concentrates	21.7	28.6	33.79	....
12. Silage	24.1	96.1	92.2	....
13. Other succulent feed	13.9	14.7	8.3	....
14. Hay	67.2	62.3	43.3	....
15. Other dry forage	17.2	11.0	10.8	....
Per 100 pounds of milk in winter				
16. Grain and other concentrates	47.5	42.6	....	....
17. Silage	59.9	151.9	....	....
18. Other succulent feed	10.3	10.2	....	....
19. Dry forage	209.1	118.5	....	....
20. Per cent of total net cost of milk represented by grain, succulent feed, dry forage, and human labor	78.6	84.9	79.7	....

* Data for all regions except Broome County, New York, were taken from *The Production, Distribution, and Food Value of Milk*, a report to Herbert C. Hoover by the Milk Committee of the United States Food Administration. Data for Broome County were obtained by the Department of Farm Management of this College.

If milk of a butterfat content lower than the average is being produced, the quantities of feed required per hundred pounds of milk may be less than in table 19. If richer milk is being produced, more feed may be required. With spring-fresh cows or largely summer production the quantities of both feed and labor may be reduced, because with the summer system more of the milk is produced on pasture, which is considerably cheaper than barn feed. It is also produced at a time of year when less labor is required. Differences in feeding or in the quality of cows may account also for variations between the quantities on particular farms and the averages given in table 19. With a larger herd less time than the average may be spent per hundred pounds of milk. Only by due consideration of all these factors should one make conclusions as to the efficiency of his animals and methods.

ADDITIONAL TABLES

The following tables will be found useful in computing the cost and the amount of feed to be charged to cows.

TABLE 20. ESTIMATING THE COST OF GROWING .... ACRES OF SILAGE CORN

	Man hours	Horse hours
Plowing		
Fitting		
Planting		
Cultivating		
Cleaning silo		
Harvesting		
Filling silo		
All other labor		
Total		
Rate per hour	............cents	............cents
Value	$	$
Total labor charge, man and horse	X	$

TABLE 20 (*concluded*)

Use of equipment at........cents per horse hour			$..................
Manure (usually 40 per cent of application is charged to corn)	....	tons	$..................
Fertilizer	....	pounds	$..................
....	....		$..................
....	....		$..................
Seed	....	bushels	$..................
Use of silo at 10 per cent of value			$..................
Use of land at 6 per cent of value			$..................
Interest on money tied up in crop			$..................
Miscellaneous expenses			
Rent of silo-filling outfit	....	hours	$..................
Coal, gasoline, or wood	....	tons, gallons, or cords	$..................
Twine	....	pounds	$..................
All other costs			$..................
....			$..................
Total cost of crop			$..................
Credit for crop not ensiled			$..................
Net cost of crop			$..................
Cost per ton			$..................

RULES FOR MEASURING

1. To measure grain in a bin: Multiply the length by the width by the height of the grain in the bin, to find the total number of cubic feet of grain. Multiply the number of cubic feet by four and divide by five to find the number of bushels.

2. To find the number of tons of hay in a mow: Find the number of cubic feet and divide by 450 to 550, depending on the depth of the mow, the kind of hay, and the time the hay has been in the mow.

3. The amount of silage put into a round silo of given dimensions can be found from table 21. To find the amount put into a rectangular silo, multiply the length by the width by the height of the settled silage. This gives the number of cubic feet of silage. The average weight per cubic foot of silage in either rectangular or cylindrical silos is given in table 21.

To find the total number of pounds of silage multiply the number of cubic feet by the weight of one foot. To find the number of tons, divide the number of pounds by 2000.

TABLE 21. APPROXIMATE CAPACITIES OF CYLINDRICAL SILOS IN TONS

Average weight of silage in pounds per cubic foot	*Depth of silage (feet)	Inside diameter of silo in feet					
		10	12	14	16	18	20
18.7	1	1	1	1	2	2	3
19.6	2	2	2	3	4	5	6
20.6	3	2	3	5	6	8	9
21.2	4	3	5	7	9	11	13
22.1	5	4	6	9	11	14	17
22.9	6	5	8	11	14	17	21
23.8	7	7	9	13	17	21	25
24.5	8	8	11	15	20	25	31
25.3	9	9	13	18	23	29	36
26.1	10	10	15	20	26	33	41
26.8	11	12	17	23	30	38	46
27.6	12	13	19	25	33	42	52
28.3	13	14	21	28	37	47	58
29.1	14	16	23	31	41	52	64
29.8	15	18	25	34	45	57	70
30.5	16	19	28	38	49	62	77
31.2	17	21	30	41	53	67	83
31.9	18	23	32	44	58	73	90
32.6	19	24	35	48	62	79	97
33.3	20	26	38	51	67	85	105
33.9	21	28	40	55	72	91	112
34.6	22	30	43	59	77	97	120
35.3	23	32	46	63	82	103	128
35.9	24	34	49	66	87	110	135
36.5	25	36	52	70	92	116	143
37.2	26	38	55	74	97	123	152
37.8	27	40	58	79	103	130	160
38.4	28	42	61	83	108	137	169
39.0	29	44	64	87	114	144	178
39.6	30	47	67	91	119	151	187
40.1	31	49	70	96	125	158	195
40.7	32	51	74	100	131	166	205
41.2	33	53	77	105	138	173	214
41.8	34	56	80	109	143	181	224
42.3	35	58	84	114	149	188	232
42.8	36	61	87	118	155	196	242
	37	63	90	123	161	204	252
	38	66	94	128	167	212	262
	39	68	97	133	174	221	272
	40	70	101	138	180	229	280

* Use the height of silage after it has settled for two days.

4. To find the number of tons of silage remaining in a silo: By consulting table 21, find the amount of silage put into the silo. Find the amount that has been used, by finding in the table the number of tons

in a silo of the same dimensions as those of the silage removed. Subtract the amount used from the amount put in. If a silo 14 feet in diameter was filled to a depth of 30 feet but has been fed from until only 12 feet of silage is left, the tons remaining would be the original tonnage (91 tons) less the tons in a 14-foot silo containing 18 feet of silage (44 tons), or 47 tons.

THE ADVANCED READING COURSE IN FARM CROPS

The Advanced Reading Course in Farm Crops comprises separate discussions of all the important crops grown in New York State, together with information on crop rotation, the use of fertilizers, seed selection, legumes, and grasses. The problem of establishing the proper crop rotation or of changing the cropping system is one of the most difficult problems of the farmer. The use of fertilizers is becoming more and more common as the price of farm products increases, justifying more intensive farming. Good seed is at the foundation of profitable crop production. Every farmer should know how to do his own seed testing. Legumes are an important factor in good farm management, not only as soil improvers but also as a source of cheap food for livestock. Grasses are the most important crop in New York State.

In the advanced course forty-one lessons are given from a textbook, supplemented by ten practical exercises. Some of the exercises provide practice in the testing of seed and in the identification of clover and grass seeds, some deal with the important types of cereals and potatoes, and others are field studies. Reports are prepared by each student on the lessons in the textbook and on the practical exercises. The reports receive careful attention from a specialist who corrects and grades them, making helpful suggestions whenever possible. The reports are then returned to the reader for review. The only expense for the Advanced Reading Course in Farm Crops is the cost of the textbook, which is not published by the College of Agriculture, and of the materials for the practical exercises.

Similar advanced reading courses are available on fruit growing and vegetable gardening.

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 142 FARM MANAGEMENT SERIES FEBRUARY, 1919

CALCULATING THE COST OF MILK PRODUCTION

DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

The available reading-course lessons for the farm are arranged in series on the following subjects: THE SOIL, FARM CROPS, LIVESTOCK, DAIRYING, FRUIT GROWING, THE HORSE, POULTRY, VEGETABLE GARDENING, FLOWER GROWING, BEEKEEPING, FARM FORESTRY, FARM MANAGEMENT, COUNTRY LIFE. New readers may enroll in one or more of these subjects. The first lesson in the series is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. The reader may register for the Farm Management Series by signing and returning this discussion paper. The space below on this page is reserved for registration in other series, and also for names and addresses of residents of New York State likely to become interested in the reading course.

(Detach, sign, and return for the next lesson in this series.)

(In answering questions, attach additional paper if needed and number the answers.)

1. How does production per cow in your herd compare with the averages given on page 220?

2. What percentage of the milk from your herd is produced in the six months from October to March?

3. How does the butterfat test of milk from your herd compare with the averages given on page 220?

4. How do the quantities of feed and labor used per hundred pounds of milk produced on your farm compare with the averages given?

5. After allowing for differences in season of production and test of milk, are your results as good as or better than the average? If not, how do you account for any difference?

6. Of the many factors influencing the cost of producing milk, size of herd, hours of labor per cow, production per cow, season of production, and feeding practice are usually the most important. Can you make any changes in these or other factors to increase your profits?

Name..

Address..

Date...

Record for year ending...

(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)

1596

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 143 FARM CROPS SERIES MARCH, 1919

POTATO GROWING IN NEW YORK

E. V. HARDENBURG

HARVESTING 300 BUSHELS OF POTATOES TO THE ACRE IN FRANKLIN COUNTY
Removing the tops from the potatoes as they are dug, to facilitate picking

Published and distributed in furtherance of the purposes provided for in the
Act of Congress of May 8, 1914

THE CORNELL READING COURSE FOR THE FARM

SUPERVISOR
ROYAL GILKEY

EDITORS FOR THE COLLEGE
BRISTOW ADAMS
RUTH VAN DEMAN

"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture."—ABRAHAM LINCOLN.

The increased area for world food production in 1919 indicates that New York farmers should return to sound permanent systems of farming. The combination of cultivated thought with labor not only is agreeable but results in efficiency in farming, which makes profits possible when price levels are becoming lower. The State College of Agriculture offers lessons for home study free to residents of New York State. The reader may obtain consecutive instruction on the subjects in which he is interested, and also the new lessons as issued. The attached discussion paper gives further information.

The reading-course lessons for the farm are elementary and brief, and are intended to arouse a desire for additional knowledge. Advanced reading courses in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods. Reports on the reading and practical exercises are corrected, graded, and returned to the reader with suggestions from specialists. The only expense in each advanced reading course is the cost of a textbook and practice material.

The reading-course lessons make useful material for educational programs in granges and other local organizations. In a number of communities groups have organized for the discussion and study of common problems, and have adopted the name *Cornell Study Club*. This may be done in connection with an existing organization or independently. Assistance is given in organizing and conducting Cornell study clubs.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

HOW THE PLANT PRODUCES SEED

L. W. Sharp

Every one is familiar with the fact that the production by the plant of seed and fruit follows the appearance of the flower. This publication discusses the connection between these two phenomena and shows how flowering leads to the production of seed and fruit. Before taking up such a discussion, however, attention must be given to two other matters of general biological importance. The first of these pertains to the cell; the second is the fact of sexuality in plants.

THE CELL

When a person looks at a brick building a half mile or more away, he can make out its general shape, its windows and other conspicuous features, but any smaller details of structure are wholly invisible. If he moves up close to the building and so gets a much enlarged view of it, he sees a large number of small units, the bricks, which are arranged in definite ways and, together with other materials, make up the building.

A similar comparison may be made in the case of the plant. If a portion of a plant, a leaf for example, is examined, its general form and certain gross features of its structure, such as stalk, blade, and veins, can be seen. Further than this nothing definite can be made out with the naked eye; the leaf, like the building viewed from a distance, appears to be "all of one piece." If, however, the leaf is examined with a microscope of sufficient power, it will be found to be composed of an immense number of little units, called *cells* (fig. 96, B, page 260).

A closer view of one of these cells (fig. 96, c) reveals the all-important fact that it is primarily an organized mass of colorless, slimy, living substance, called *protoplasm*. This protoplasm is what Huxley fittingly called "the physical basis of life," for, so far as is known, the phenomena of life are always associated with this substance. The cell always has at least two parts; first, a mass of more or less watery protoplasm, called *cytoplasm*, which may make up the greater part of the bulk of the cell; and second, a distinct rounded mass of somewhat firmer special protoplasm, called the *nucleus* (plural, *nuclei*). The nucleus floats in the cytoplasm, and altho both are composed of protoplasm they do not mix, for they are separated by a delicate membrance. In many cells there are also other bodies, for example the *chloroplasts*, which contain the

green coloring matter. In the plant cell the cytoplasm commonly contains one or more large droplets of watery cell sap, and the whole cell is usually bounded by a rather firm cell wall. For the present discussion, however, the plant cell may be thought of as a little, walled mass of protoplasm with at least two main parts: cytoplasm and nucleus.

The whole body of the plant — leaf, stem, root, flower parts, seed, and all — is made up of millions of these cells. The same is true of the animal body; it is composed entirely of cells and their products. Many plants and animals have bodies microscopic in size and consisting of a single cell, but the ones most commonly met are composed of a vast number of cells. Furthermore, every many-celled individual, plant or animal, begins its life as a single cell. This cell divides to form two cells, which hang together; these two divide to form four, and so on until all the cells of the body are produced. These cells, while multiplying in this way, become differentiated into many kinds and together build up the various tissues and organs of the body. The cell may therefore be called the *unit of structure*, and studies of its physiological activities show it to be *the unit of function*. All this is known as the *cell theory*; it was stated about eighty years ago and has since become firmly established as one of the fundamental propositions in biological science.

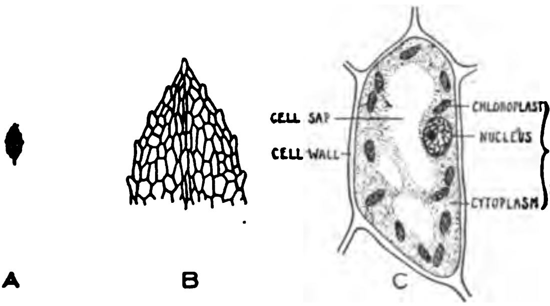

FIG. 96. CELLULAR STRUCTURE OF A MOSS LEAF
A, Leaf of moss, natural size; B, a portion of the moss leaf enlarged, showing the outlines of the cells; C, a single cell greatly magnified, showing the principal parts

SEX IN PLANTS

A second fundamental feature of plant life is that of sexuality. It is commonly known that in animals offspring are produced as the result of a sexual process. This is also true of plants; the embryo contained in the seed is the result of a sexual process. Altho many plants have in addition other modes of reproduction, sexual reproduction has been found in all but a few obscure lowly forms, and is just as fundamental a feature in plants as in animals. In both cases the central fact of the process is the union of the nuclei of two sexually differentiated cells. The cell that results from the union gives rise, by a series of divisions, to all the cells of the body of the new individual.

THE FLOWER

Upon the basis of these two important biological conceptions — the cellular structure and the sexual origin of the organism — flowering and seed production can be better understood. The nature of these processes can be made clear by describing what happens in a particular case. The cherry is chosen as an example, not only because its flower and fruit are familiar to all, but also because its development is typical of a large class of fruits, including the peach and the plum. The flower will first be examined, after which the steps leading to the formation of the seed and the fruit will be described.

A longitudinal section of the cherry flower, showing its various parts, is given in figure 97, A. At the base is the *receptacle*, from which the other flower parts appear to arise. Beginning with the outermost parts is a ring of *sepals*, together constituting the *calyx*. The sepals are usually rather firm in texture and afford protection to the other young parts before the flower opens. Next is a set of *petals*, together constituting the *corolla*. The petals are commonly more or less showy, and thru their showiness play a very important secondary part in the reproduction of the plant. This is discussed in greater detail under methods of pollination.

Next to the petals is a set of *stamens*; in the little sacs, *anthers*, at their tips are produced the *pollen* grains. The stamens are often referred to as the male parts of the flower, since they contribute the male element in the process of sexual reproduction. In the center of the flower is the *pistil*. The pistil shows three general regions: the *ovary*, or swollen portion at the base; the elongated *style*; and the *stigma*, or expanded tip. The pistil is often called the female part of the flower, because the female element is borne within it.

Within the ovary is a small, rounded body, the *ovule*. In the young cherry flower there are two ovules, but usually only one comes to maturity. The ovule is the part that is to become the seed; therefore its structure (fig. 97, B) should be studied carefully. It consists primarily of a central portion surrounded by an envelope, or *integument*. In the central portion is a cavity, the *embryo sac*, partly filled with cytoplasm. In this sac can be seen several cells with their nuclei; one of these cells is the *egg*. An egg is not ordinarily considered so small and simple a thing, for the hen's egg, with its comparatively large size and elaborate structure, is perhaps the most familiar type of egg. These features of the hen's egg are due, however, to the presence of a large amount of storage material and a hard shell, and in the case of a fertile egg to the fact that at the time it is laid it has already undergone the first stages of develop-

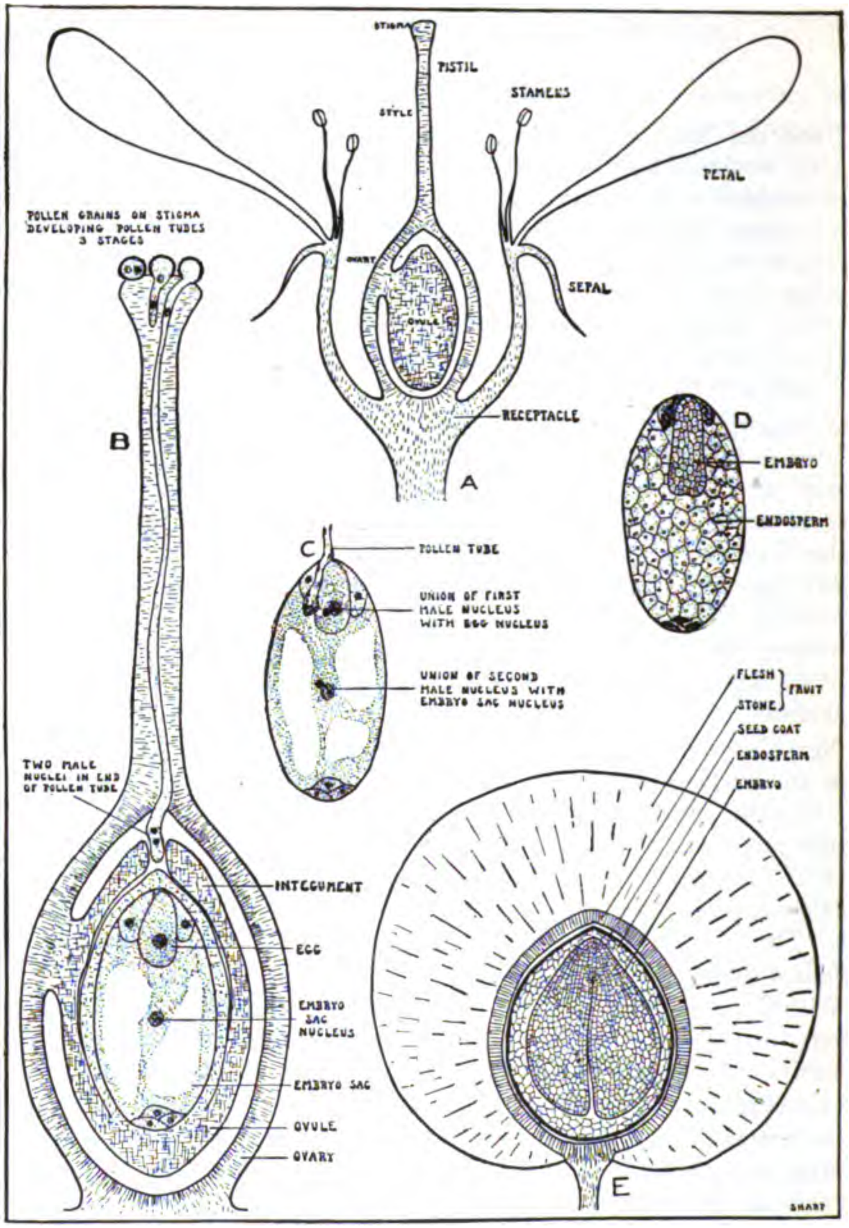

FIG. 97. MAIN STEPS IN THE DEVELOPMENT OF THE SEED AND THE FRUIT FROM THE FLOWER

These diagrams are based in general on the cherry, but, for the sake of clearness, proportions have been somewhat altered and many unimportant details have been omitted

A, Longitudinal section of cherry flower, enlarged 8 diameters. B, Pistil, showing structure of ovule and development of pollen tubes, enlarged 20 diameters. C, Embryo sac with double fertilization in process. D, Development of the embryo from the fertilized egg; the endosperm has developed and filled the sac. E, Longitudinal section of a nearly ripe cherry, enlarged 8 diameters. When fully mature the endosperm will have been entirely digested by the embryo, which will fill the seed completely. The seed coat in the cherry is only a brown papery lining of the pit

ment into a chick. The real nature of an egg is consequently obscured in such an example. An egg before fertilization is fundamentally a single cell, altho various modifications may be present in its structure. Floating freely in the cytoplasm of the embryo sac is the embryo sac nucleus. There are also other cells in the base of the sac, but they play no important part in seed production.

In brief, the pistil at the time the flower opens contains an ovule, and within the ovule is an egg. All is now ready for pollination.

POLLINATION AND FERTILIZATION

The pollen grains are shed from the anthers, and thru various agencies are brought to the stigma, where they are held by a sticky secretion. This is *pollination*. The pollen grain (fig. 97, B) at this time is a heavily walled cell with two nuclei. Very soon the thin inner portion of the wall pushes out thru an opening in the hard outer portion and forms a pollen tube, which begins to grow downward thru the tissues of the style. As this tube grows longer, the nuclei wander into it and one of them divides to form two male nuclei. The tube continues to grow, pushing down into the cavity of the ovary and finally, thru an opening in the integument, directly into the embryo sac. There it bursts and discharges the two male nuclei into the cytoplasm of the sac (fig. 97, C). A curious and very significant thing now occurs. One of the male nuclei penetrates into the egg cell and there unites with the nucleus of the egg; the two nuclei flow together completely. This is *fertilization*, and it should not be confused with pollination, which is merely a preliminary step. The other male nucleus advances to the embryo sac nucleus and unites with it. These two unions of nuclei are together called double fertilization, but the union of the first male nucleus with the egg nucleus is the more important of the two.

After pollination and fertilization have occurred, the petals, the stamens, and the cup-shaped part of the receptacle (the "shuck"), wither and drop off.

DEVELOPMENT OF THE SEED AND THE FRUIT

What results from the two nuclear unions described?

The fertilized egg is the cell that is to give rise thru a long series of divisions to the many cells of the new individual, as pointed out in the brief discussion of the cell theory. An early stage in the development of the new individual is shown in figure 97, D. The fertilized egg cell has divided into a number of cells, forming a growing mass in which the parts of the new plant have not yet been formed. This is the *embryo*.

Meanwhile the nucleus formed by the union of the second male nucleus with the embryo sac nucleus has divided repeatedly and produced a mass of tissue filling the embryo sac. This is the *endosperm*, a nourishing tissue that is gradually digested by the growing embryo, which lies embedded in it.

While the embryo and the endosperm are developing within the embryo sac, the integument of the ovule becomes modified and forms the *seed coat*. The wall of the ovary also undergoes great modification and becomes the tissue of the *fruit*. All these processes — the development of the embryo, the formation of the endosperm, the transformation of the integument of the ovule into the seed coat, and the transformation of the ovary wall into fruit tissue surrounding the seed — are going on at the same time, and the result is shown in figure 97, E, which represents a longitudinal section of a nearly ripe cherry. Beginning at the outside is the flesh, which represents the outer part of the ovary wall. Within this is the hard wall of the cherry stone, which corresponds to the inner portion of the ovary wall. The wall of the ovary thus differentiates into two layers of fruit tissue: the flesh, and the stony wall of the pit. Inside the cherry stone, or pit, is the seed, which may be lifted out when the stone is cracked open. The seed coat, as already stated, represents the integument of the ovule. In many plants this seed coat becomes very thick and hard, but in the cherry it is thin and papery. In this case the stony layer of the fruit, rather than the seed coat, affords protection to the embryo.

Within the seed are the endosperm and the embryo. The greater part of the endosperm has now been digested by the growing embryo, and by the time the cherry is fully mature the remainder will have been used. The embryo further shows a certain degree of differentiation. The point at its upper end is to be the root, which emerges first from the seed at the time of germination, and below are the two seed leaves, or *cotyledons*, which are most conspicuous soon after the embryo has freed itself from the seed coat. The stem will develop from a point between the cotyledons.

During the resting period of the seed, in case it has such a period, the embryo remains in a dormant, tho living, condition; and when brought under conditions suitable for germination, it merely resumes its growth. The statement is often made that when sown the seed dies and the new plant comes to life in some mysterious way. This is contrary to fact, for altho the seed coat, which forms no part of the new plant, usually decays, the embryo has been living from the first and simply continues its development when germination occurs. The chain of life is not broken.

The fruit therefore represents a ripened ovary, and the seed a ripened

ovule. The most important fact concerning the seed is that it contains a new individual in a partly developed, or embryonic, state — a new individual that is the result of sexual reproduction.

In the preceding paragraphs have been pointed out the parts of the flower that are essential to reproduction, and how in the case of the cherry the ovule and the ovary become converted into the seed and the fruit. Other examples will show how these same principles apply to seeds and fruits of other types.

If a bean flower is dissected, the elongated ovary will be found to contain a row of ovules. After pollination and fertilization have occurred, the ovary enlarges, thickens, and becomes the bean pod, while the ovules are converted into a row of bean seeds within it.

In the apple, the pear, or the quince, is a somewhat different condition. The ovary is not simple like that of the cherry, but is divided by partitions into five compartments, each containing several ovules. Furthermore, the receptacle grows up around the ovary, so that the ovary appears to be below the flower rather than within it. It is very much as if the part of the receptacle that projects upward around the ovary in the diagram of the cherry flower, were brought close to the ovary and joined with it. The ovary of the apple is, in effect, embedded in the receptacle. This whole structure ripens into the apple fruit. If an apple is cut in two transversely, in the center can be seen five compartments of the ovary with ripened ovules, or seeds. The core therefore represents the modified tissue of the ovary, while the flesh around the core is receptacle tissue. So altho both the cherry and the apple have abundant flesh, it is not of the same origin in the two cases. In the cherry it is the ripened outer portion of the ovary, while in the apple it is mostly ripened receptacle and the ovary is only the central portion, or core. The flesh of the strawberry is also receptacle tissue.

Indian corn illustrates still another type of seed production. In this case stamens and pistils are not borne together in the same flower. There are flowers with stamens only, *staminate* flowers, in the tassel, and flowers with pistils only, *pistillate* flowers, on the cob. Each young corn grain on the young ear is an ovary containing a single ovule. The silks, which later project beyond the husks, are the greatly elongated styles. The stigma in this case is not a conspicuous part at the end of the style, but is an elongated area lying along the side of the silk. The pollen tube must grow a long distance thru the silk to the ovule within the ovary, or young grain. After fertilization the styles wither and the grains ripen, and consideration of what flower parts are concerned shows at once that the corn grain is really a fruit, not merely a seed. Its external coat represents the ripened ovary wall, not the ripened integument as in the

case of a seed. Within this outer coat is the seed proper. The bulk of the grain is occupied by the endosperm, or starchy portion, and the embryo, or so-called germ.

The cherry, the bean, the apple, and the corn grain, altho they differ greatly in appearance, have many fundamental features in common. In every case the embryo within the seed is formed by the development of a fertilized egg cell. In all, the endosperm results from a second nuclear union; in the corn this endosperm is abundant, but in the bean, the apple, and the cherry it has been digested by the developing embryo. The coat of the seed in all four examples is formed by the transformation of the ovule tissues, or integument. In the ovary wall are the greatest differences. In the corn the ovary wall simply hardens closely around the ovule tissues and forms the resistant covering of the grain. In the bean it hardens but remains separate from the ovules, or seeds, and forms the dry pod. In the cherry it develops into two layers: an inner stony portion, which forms the wall of the pit; and an outer fleshy portion, which is edible. In the apple the ovary is embedded in the receptacle, which grows up around it and later develops into edible flesh.

As a rule, therefore, the pistil and the structures it contains become the fruit and the seed. Since the pistil is the most sensitive to injury of all the flower parts, the reason is apparent why late spring frosts affect certain fruit crops disastrously.

METHODS OF POLLINATION

The reason why flowering precedes the development of seed and fruit is now apparent, for the seed and the fruit are transformed flower parts. If there were no flowers, neither seeds nor fruit would be produced, as in the familiar case of young fruit trees that do not bear. Since this intimate connection of flowers on the one hand and seed and fruit on the other is established, it is further manifest from the description of the processes involved that pollination is of the greatest importance, for if pollination fails to occur no seed and fruit are produced even tho flowers are present. The next question is, then, How is pollination brought about?

In many flowers both stamens and pistils are present and ready to function at the same time. Many other species, however, have the stamens and pistils located in different flowers, as in the case of corn, or even on different plants, as in the case of the willows and some varieties of the strawberry. This explains why in cultivating such varieties of strawberries both staminate and pistillate plants must be set together in order to get a crop. Also, even tho both stamens and pistils are present in the

same flower, in many cases they are not ripened at the same time, so that as far as pollination is concerned the situation is much the same as if a single flower had only one kind of organ. In the flowers of the first kind, in which stamens and pistils are present together, the transfer of pollen from stamen to stigma would not appear to be a difficult matter, but in the case of stamens and pistils borne in different flowers, or even on different plants, pollination becomes a serious problem. Solution of this problem is of course of vital importance to the plants, because of the part played by pollination in the process of reproduction. The following examples show how the problem has been solved in a few cases.

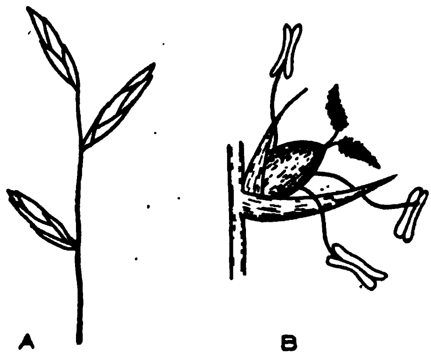

FIG. 98. DIAGRAMS SHOWING THE STRUCTURE OF FLOWERS THAT ARE CHIEFLY WIND-POLLINATED

A, Flowering portion of grass with three inflorescences, each containing several flowers. B, Single grass flower, showing the three dangling stamens, from which the pollen is carried by the wind, and the pistil with two feathery stigmas upon which pollen blown from other flowers may be caught

In many land plants the pollen is carried from the stamens to the stigmas of other flowers by air currents. The pollen grains are so small that they form a fine, dust-like powder, and may be carried many miles by the wind. This wind pollination occurs in many common plants, such as grasses (fig. 98), oaks, and pines. But any one who has walked thru a cornfield at the time the pollen is being shed from the flowers in the tassels of the corn, or who has had his boots well dusted by the pollen from the ragweed along the roadside, or who has seen the clouds of yellow pollen ("showers of sulfur") being carried away from a pine tree on a breezy day, can scarcely fail to see that this method of pollination is extremely wasteful. Out of the myriads of pollen grains formed in the corn tassels only a few are brought to the proper place on the silks; the majority are lost. In other plants the staminate flowers are in many cases a long distance, even many miles, from the pistillate flowers; in these instances an even greater portion of the pollen must be wasted. But nature has developed more efficient and precise methods of pollination than that by air currents.

Such a method is pollination by insects, which carry pollen from the stamens of one flower to the stigma of another. The hum of bees over clover fields and around blossoming fruit trees is one of the commonest sounds of the open country in summer, and is indicative of one of the most remarkable adjustments in nature. The bee is concerned only with

the getting of nectar and pollen for food, but as it flies from flower to flower it unconsciously brings about a very effective pollination for the plant. As the bee reaches into the flower for nectar, its body becomes more or less covered with the dusty or sticky pollen, and when it alights upon the next flower of the same kind some of this pollen is almost certain to be rubbed off on the stigma. This cross-pollination is thought for certain reasons to be more advantageous than close pollination (pollination within the same flower), and the insects thru their visits bring it about even in flowers that have both stamens and pistils. The

FIG. 99. TWO TYPES OF FLOWERS IN WHICH POLLINATION AND CROSS-POLLINATION ARE EFFECTED BY INSECT VISITORS

A, Longitudinal section of violet flower, showing nectar (n) in the spur formed by the lower petal. In reaching for the nectar the insect brushes against the stamens and the stigma, bringing about pollination. B, Longitudinal section of lady's-slipper showing stigma (a) and stamen (b), which are rubbed against by the bee as it attempts to escape from the pouch by the route indicated by the arrow

flower from which the pollen comes must, as a general rule, be one of the same species as the flower pollinated, tho not necessarily of the same variety of that species.

If the characters of the flowers that are pollinated thru the agency of insects are compared with those of the flowers that are wind-pollinated, notable differences are seen at once. The wind-pollinated flowers are relatively inconspicuous; they have small petals or even none, and no decided odor, and produce little or no nectar. The insect-pollinated flowers, on the other hand, usually have very showy corollas and decided odors, and in addition produce a much greater amount of nectar than do the wind-pollinated flowers. Evidently there is a definite connection between these characters and insect pollination. The insect has an amazingly keen sense of smell, and as it flies about searching for food it catches the odor of flowers on the breeze and is at once attracted to the flower, which contains food in the form of nectar and pollen. As the insect draws near the flower, the showy corolla attracts it to the proper place. The insect is thus aided in its work of food gathering, and, since the arrangement of the flower parts is commonly such that the insect cannot

get at the nectar without rubbing against stamens and stigma (fig. 99, A), the insect in turn unconsciously renders the plant an important service, that of pollination.

Beginning with the work of the great naturalist Darwin, many volumes have been written about the marvelous structures that various flowering plants have developed in this connection. In many cases the structure of the flower has become profoundly modified, and all sorts of arrangements are present whereby pollination by insects is rendered more precise and effective. This is notably true of the orchids and members of the mint family. For example, in the lady's-slipper, a common orchid (fig. 99, B), the bee, which has crowded into the pouch in search of food, must rub against the stigma when it attempts to escape by the only easy route (indicated in the figure by the arrow). Having previously received pollen from other flowers, the bee thus brings about pollination. After rubbing against the stigma it also brushes against the stamens, and so receives a supply of pollen, which will be deposited on the stigma of the next lady's-slipper visited. In this way precise cross-pollination results.

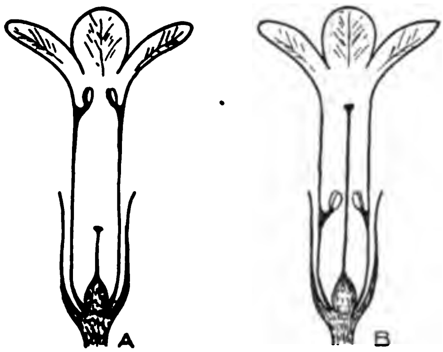

FIG. 100. TWO TYPES OF PRIMROSE FLOWERS WITH PARTS SO ARRANGED AS TO INSURE CROSS-POLLINATION

A, Short-styled flower; B, long-styled flower. This arrangement of floral parts is known as heterostyly, and is explained in the text

Another arrangement insuring cross-pollination is known as *heterostyly*, and is illustrated by the diagrams of the primrose in figure 100. The primrose flowers are of two types: in one the style is short and the stamens are inserted high up on the corolla tube; in the other the style is long and the stamens are inserted much lower. An insect that is too large to enter the corolla tube to get the nectar secreted at the bottom must reach for it with his long sucking apparatus, or proboscis. In thus reaching for the nectar in the short-styled flower, the insect receives on its head a mass of pollen from the stamens near the top of the tube. When it visits a long-styled flower, this pollen is rubbed on the stigma, and at the same time a new mass from the stamens below is received near the end of the proboscis. The short-styled flower next visited will receive this pollen upon its stigma. The long-styled flower is usually pollinated with pollen from the high stamens in the short-styled flower, while the short-styled flower receives pollen from the low stamens of the long-styled flower. Cross-pollination thus occurs in the majority of cases.

Many flowers have odors that are exceedingly pleasing to the human sense of smell, but many others have an odor like that of carrion, offensive to man but very attractive to insects that lay their eggs in such material. Such odors are very effective in bringing about pollination, and the effect on human feelings is a minor matter.

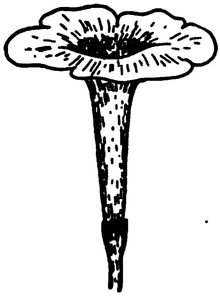

FIG. 101. PETUNIA FLOWER

This flower has a long corolla tube in the bottom of which nectar is secreted; therefore it is visited by insects with long mouth parts, such as the moth shown in figure 102

Some flowers, because of their peculiar structure (fig. 101), are regularly visited only by insects with long mouth parts, such as those possessed by moths and butterflies (fig. 102). Clover is regularly visited by the bumblebee, which, by means of its long proboscis, can get the nectar that many other insects are unable to reach. Furthermore, in some flowers only one kind of insect can perform the service of pollination, and if that particular kind is kept away from the plant no seeds can be produced. In time this would result in the extinction of that species of plant, and there is reason to believe that this has occurred in certain cases. Therefore specialization of this kind, if carried too far, may endanger the very existence of the plant.

From the foregoing discussion the true meaning of flowers should be clear. They are often thought of only as objects of beauty, and certainly the beneficial aesthetic effect they have should never be wholly disregarded. But the flower is of benefit primarily to the plant itself, and its chief value lies in the way in which it brings about pollination and therefore a more effective reproduction. The great variety of adaptations developed in this connection and the surprising degree of refinement to which many of them have been carried, testify to the extreme importance of effective pollination to the plant in its struggle for existence. In the paramount need of more certain reproduction is found the key to the evolution of the flower and its many modifications.

FIG. 102. MOTH WITH LONG PROBOSCIS

Such long mouth parts enable moths to reach the nectar in flowers with long corolla tubes, such as the petunia shown in figure 101

(Drawing adapted from a photograph by M. V. Slingerland)

THE CORNELL READING COURSE FOR THE FARM

The Cornell Reading Course for the Farm provides consecutive instruction on subjects selected by the reader, furnishes lessons on subjects of general interest as they are issued, and encourages correspondence by means of the discussion paper. Residents of New York State may register without charge for one or more of the following series in the reading course. If particular lessons are desired instead of a course of reading they may be obtained on request.

THE PLANT

144 How the plant produces seed
38 Principles and methods of plant breeding
129 Improving the corn crop by selection and breeding
44 Methods of breeding oats

THE SOIL

74 Introduction to the principles of soil fertility
42 Tilth and tillage of the soil
70 Soil moisture and crop production
78 Land drainage and soil efficiency
50 Nature, effects, and maintenance of humus in the soil
141 Farm manure: its production, conservation, and use

FARM CROPS

143 Potato growing in New York
66 Meadows in New York
90 Alfalfa for New York
110 Buckwheat
124 Field bean production
108 Culture of sweet clover and vetch

LIVESTOCK

137 The dairy herd
114 Silos, and the production and feeding of silage
131 Contagious abortion of cattle
136 The beef breeding herd in New York State
119 The curing of meat and meat products on the farm
134 Starting a flock of sheep
115 Keeping sheep for profit
139 Swine production in New York

DAIRYING

142 Calculating the cost of milk production
86 The production of clean milk
102 Cooling milk
82 Cream separation
32 Composition of milk and some of its products

60 Farm butter-making
98 Practical examples in dairy arithmetic
140 The Babcock test, and testing problems
135 The farm ice supply

FRUIT GROWING
125 Orchard soil management
104 Pruning
84 Insects injurious to the fruit of the apple
123 Top-working and bridge-grafting fruit trees
72 Culture of the grape
36 Culture of red and black raspberries and of purple-cane varieties
52 Culture of the blackberry

THE HORSE
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POULTRY
130 Rearing chickens: Brooder house construction
133 Preparation of market eggs on the farm

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92 Summer care of the home vegetable garden
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FLOWER GROWING
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BEEKEEPING
138 Beginnings in beekeeping

FARM FORESTRY
12 The improvement of the woodlot
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40 County, town, and village forests

COUNTRY LIFE
64 The rural school and the community
76 Birds in their relation to agriculture in New York State
94 The farm fishpond
96 The surroundings of the farm home
59 Sewage disposal for country homes

This list is correct to April, 1919. The demand may at any time exhaust the supply of particular numbers.

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 144 | THE PLANT SERIES | APRIL, 1919

HOW THE PLANT PRODUCES SEED

DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

The available reading-course lessons for the farm are arranged in series on the following subjects: THE PLANT, THE SOIL, FARM CROPS, LIVESTOCK, DAIRYING, FRUIT GROWING, THE HORSE, POULTRY, VEGETABLE GARDENING, FLOWER GROWING, BEEKEEPING, FARM FORESTRY, COUNTRY LIFE. New readers may enroll in one or more of these subjects. The first lesson in the series is sent on enrollment, and subsequent lessons are sent, one at a time, on the return of discussion papers. The reader may register for The Plant Series by signing and returning this discussion paper. The space below on this page is reserved for registration in other series, and also for names and addresses of residents of New York State likely to become interested in the reading course.

(*Detach, sign, and return for the next lesson in this series.*)

(In answering questions, attach additional paper if needed and number the answers.)

1. What are the units of which all plant and animal bodies are built up? Of what are these units composed? How do they multiply?

2. What are the most essential parts of the flower? Why?

3. What is the difference between pollination and fertilization? Which is really the sexual process?

4. What is the origin of the embryo in the seed?

5. What occurs when the seed germinates?

6. Can you think of any value to the plant of an elaborate fruit around the seeds?

7. How is pollination brought about? How does a conspicuous flower aid in pollination?

8. How do you account for the fact that when there are rains or high winds during the flowering period an orchard produces a poor crop of fruit?

9. How is one kind of crop contaminated by a closely related kind grown in the same vicinity? Why is it not contaminated by plants of other widely different kinds?

Name..

Address..

Date..

(*Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.*)

THE CORNELL READING COURSE FOR THE FARM

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

LESSON 145 VEGETABLE GARDENING SERIES MAY, 1919

PLANNING THE HOME VEGETABLE GARDEN

GROWING EARLY PLANTS

ROBERT BIER

A PRIZE-WINNING GARDEN, CONVENIENTLY LOCATED

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

THE CORNELL READING COURSE FOR THE FARM

SUPERVISOR
ROYAL GILKEY

EDITORS FOR THE COLLEGE
BRISTOW ADAMS
RUTH VAN DEMAN

"No other human occupation opens so wide a field for the profitable and agreeable combination of labor with cultivated thought as agriculture."— ABRAHAM LINCOLN.

The increased area for world food production in 1919 indicates that the New York farmers should return to sound permanent systems of farming. The combination of cultivated thought with labor not only is agreeable but results in efficiency in farming, which makes profits possible when price levels are becoming lower. The State College of Agriculture offers lessons for home study free to residents of New York State. The reader may obtain consecutive instruction on the subjects in which he is interested, and also the new lessons as issued. The attached discussion paper gives further information.

The reading course lessons for the farm are elementary and brief, and are intended to arouse a desire for additional knowledge. Advanced reading courses in farm crops, fruit growing, and vegetable gardening, provide more complete instruction in accordance with modern correspondence methods. Reports on the reading and practical exercises are corrected, graded, and returned to the reader with suggestions from specialists. The only expense in each advanced reading course is the cost of a textbook and practice material.

The reading course lessons make useful material for educational programs in granges and other local organizations. In a number of communities groups have organized for the discussion and study of common problems, and have adopted the name *Cornell Study Club*. This may be done in connection with an existing organization or independently. Assistance is given in organizing and conducting Cornell study clubs.

Correspondence is a medium for the exchange of helpful information. Letters will receive careful attention.

PLANNING THE HOME VEGETABLE GARDEN

A well-thought-out plan will go a long way toward making the home vegetable garden a success. Space can then be utilized to the best advantage, and seed, supplies, and equipment can be provided in advance of the planting season, thereby saving much time and confusion. The plan should be drawn on paper and should show where each vegetable is to be planted, the number of rows of each kind, and whether it is to be grown as an intercrop, a succession crop, or will occupy the ground during the whole season. So far as space will permit, the garden should furnish a supply of fresh vegetables for table use thruout the growing season, and a surplus for canning and storing. In making the plan the following points must be considered: size, location, and arrangement of the garden; kind of cultivation to be used; soil; crops and varieties, and their adaptation to local conditions.

SIZE, LOCATION AND ARRANGEMENT

In the country, a vegetable garden from one-eighth to one-half acre in size should meet all demands for home use, the exact size depending on the number of persons in the family and the kind of cultivation to be given. A garden one-eighth acre in size if very productive and intensively cropped, should supply the average family with fresh vegetables thruout the growing season and with a surplus of the most important kinds for canning and storing. If one-fourth acre is available and is equally productive, the rows may be spaced farther apart and horse-drawn tools used in cultivating. It is seldom advisable to plant more than one-half acre in vegetables for home use, no matter how much ground is available. In the city, the size of the garden generally depends on the space available.

Soil and slope of the ground should be considered in locating a garden, but if possible it should be near the house. This is an advantage both in caring for the garden and in harvesting the crops. A garden is more likely to be neglected if it is far from the house. If the garden is to be near buildings, it should be on the south or the east side so that it can get the most sunlight and be protected from cold winds.

Many back yards in cities are shaded during the greater part of the day, and it is doubtful whether any vegetables can be grown to advantage on some of these plots. However, where sunlight may be expected for at least three hours a day, the leaf crops, such as lettuce and spinach, may be grown. Such crops as tomatoes, which mature fruits, require

at least five hours of sunlight each day. Where there is complete shade all day, it would be a waste of time to plant any vegetables.

The space allotted hotbeds and coldframes and to perennial crops, such as asparagus, rhubarb, horse-radish, and artichoke, should be at one end or along the side of the garden, in order to facilitate plowing and cultivation. If bush fruits and tree fruits are in the same garden, they should be placed on the west or the north, or in the direction of the prevailing winds, to serve as a windbreak.

FIG. 103. A WELL-PLANNED GARDEN

This shows arrangement of the main season crops. Some of the early vegetables have been harvested and second plantings made

In general, the rows should run lengthwise, especially in the larger gardens, where horse cultivation is used. In small gardens, short rows may be more convenient. In any case the rows should run at right angles to the slope of the land if it is rolling or hilly. If the rows run east and west, the taller crops should be placed on the north side of the garden, in order to prevent them from shading the low-growing plants.

KIND OF CULTIVATION

The kind of cultivation practiced will be determined by the size of the garden and the condition of the soil. Intensive gardening is not as practi-

cable on very stony or very rough ground as it is on a productive sandy loam. The comparative cost of hand and horse cultivation should be considered and the garden planned accordingly. In general, horse cultivation will be found more economical for the large garden on the farm, and hand cultivation more economical for the city garden where space is limited.

TREATMENT OF GARDEN SOILS

Garden soils may be divided into clay loam, sand, gravel, or a combination of these. Loamy soils are usually the best, because they are friable and contain more organic material than sandy or gravelly soils. A good application of manure supplemented with commercial fertilizer will generally furnish sufficient plant food for a good crop.

Clay soils are usually wet and sticky, and require careful management. Applications of lime or sifted coal ashes aid in making clay soils more friable and open. The sifted coal ashes contain little or no plant food, but improve the texture of the soil. It is a good plan to test samples of the soil from various parts of the garden to see whether it is acid. The test is made by placing moistened soil in a cup or glass and inserting a piece of blue litmus paper into the soil. If the litmus paper becomes a decided pink in color, the soil is acid and requires lime to neutralize it. Acidity will be found in practically all garden soils to which no lime has been added for several years. An application of slaked lime at the rate of 4 pounds to 100 square feet will be found beneficial on lighter soils; heavier soil will require twice this amount.

Sandy soils are generally deficient in organic matter, but this condition can be remedied by the addition of manure or by turning under green crops. The gravelly soils are more deficient in organic matter and do not hold water for any great length of time. The addition of manure is needed to make this type of soil more productive and more retentive of moisture.

For early crops a light soil is best, while for late crops a heavier soil is preferable because it retains moisture better. If the garden contains more than one type of soil, these characteristics can be utilized to advantage in planting the crops.

More complete information about soils and their treatment is given in other publications of this College.[1]

[1]Introduction to the principles of soil fertility. Cornell Reading Course for the Farm, Lesson 74.
Nature, effects, and maintenance of humus in the soil. Cornell Reading Course for the Farm, Lesson 50.
Outline of the relation of the use of lime to the improvement of the soil. Cornell Extension Bulletin 5.

MANURES AND FERTILIZERS

All plants need food, which is just another name for fertilizer. The plant absorbs the compounds it needs from the soil and carries them to the leaves where they are manufactured into foods that the plant uses in growth.

Stable manure is the best fertilizer for the garden, as it supplies both plant food and humus. The humus acts in a very complicated way, helping to hold water and to convert insoluble plant food in the soil into available form. Well-rotted manure may be spread on the garden after it is plowed; but if fresh manure is used, it should be applied in the fall or early spring and plowed under. For a garden 50 feet square, two 2-horse loads of manure would not be too much to apply. A soil that is well-manured does not bake or cake.

Stable manure, however, does not contain enough of the elements that the plant needs for growth, and generally loses some of these elements during handling. Manure is deficient in phosphorus, which may be supplied by applying with the manure 1 to 2 pounds of acid phosphate to 100 square feet of area.

Poultry manure may be used, but must not be applied too heavily. It is rich in nitrogen, and too heavy an application will cause an excess growth of tops and may even burn the plants. Poultry manure is especially valuable in leaf crops, such as spinach, lettuce, and celery; with tomatoes and beans it may produce foliage at the expense of fruit.

If manure is not obtainable, commercial fertilizers may be used. These fertilizers are said to be complete when they contain the three elements, nitrogen, phosphorus, and potassium.

Certain vegetables, particularly those crops grown for their foliage, such as cabbage, celery, and lettuce, require a soil rather richer in nitrogen. Vegetables grown for the fruit, such as tomatoes, require more phosphorus and potassium in proportion to nitrogen. A complete fertilizer analyzing 2 to 4 per cent nitrogen, 8 per cent phosphorus, and 4 per cent potash, ought to supply the needs of the average back-yard soils. The amount of fertilizer to apply will vary with the natural fertility of the soil, the previous treatment, and the crops to be grown. A pound for 50 square feet should bring desired results on most soils. No amount of commercial fertilizer, however, will make up for a deficiency of humus; in fact, large applications of commercial fertilizers are justified only on soils well-supplied with humus. When manure is not used the humus is usually supplied by turning under a soil-improving crop. Rye is the crop most generally used as it may be planted late in the season after the vegetables have been harvested.

CROPS AND VARIETIES FOR THE HOME GARDEN

Generally too little attention is given to the needs and preferences of the family, when the garden is planned. Crops that are not relished should never be grown unless for trial or test. In many gardens there is too great a supply of lettuce and string beans and not enough of beets, carrots, and other vegetables. In studying vegetables to be planted, especially where the space is limited, the food[2] and the money values as well as the space required should be considered.

In a limited area, quick-maturing crops and those producing large yields in proportion to the space required should be planted, for example, tomatoes, eggplant, beans, lettuce, beets, carrots, parsnips, and onions. After early crops have been removed, other vegetables may be planted in the same space. For example, radishes, lettuce, onions, or early beets may be followed by string beans, late cabbage, or celery. In some locations the second crop may be followed by a fall crop of spinach, lettuce, or beets. In a small garden it would be unwise to plant such crops as potatoes, corn, and cucumbers. These crops require a large space in proportion to the food produced and are suitable only for a rather large garden.

No list of varieties could be given that would be best for every home garden in this State. This must be learned from neighbors and from experience. The list in this bulletin is only for the guidance of the beginner and includes the varieties that are grown most widely thruout the State.

ASPARAGUS

Palmetto, Giant Argenteuil, Reading Giant. (One- or two-year-old roots should be bought instead of growing plants from seed, as at least a year will be saved.)

BEAN

Dwarf, or bush

Green-podded: Stringless Greenpod, Refugee, 1000 to 1.

Wax-podded: Wardwell Wax, Golden Wax.

Dry shell: White Marrowfat, Red Kidney, and Boston Pea.

Lima

Bush: Henderson Bush Lima, Dreer Bush Lima, Burpee Bush Lima, and Forkhook Bush Lima.

Pole: Early Leviathan, King of the Garden.

Pole

Green-podded: Kentucky Wonder.

Wax-podded: Golden Cluster.

[2] Information on the food value of various vegetables is given in *Short Cuts for the Home Dietitian*, Cornell Reading Course for the Farm Home, Lesson 112.

(In many sections of New York it is not advisable to plant pole beans; they require a longer season than do bush beans, and in addition must be staked.)

BEET

Early: Crosby Egyptian. (By making successive plantings this variety may be used for all purposes.)

Late: Detroit Dark Red, Blood Turnip.

BRUSSELS SPROUT

Long Island Improved.

FIG. 104. BRUSSELS SPROUTS

CABBAGE

Early: Jersey Wakefield, Copenhagen Market, All Head Early.

Midseason: Glory of Enkhuizen, Succession.

Late: Danish Ball Head, Red: Red Rock, Red Dutch. (The red cabbages are slow maturing but are well adapted for making cold slaw.) Savoy: Drumhead Savoy. (The savoy cabbages are late maturing, with crumpled instead of smooth leaves. The plants are hardy but slow to head, and the heads are likely to be small and more or less loose. They have a superior flavor, however, especially after they have been touched with frost, and should be more grown in the home garden.)

CARROT

Early: Chantenay, Oxheart. (Oxheart is especially adapted to the heavier soils.)

Late: Danvers Half-long. (This variety is recommended for storing.)

CAULIFLOWER

Snowball, Dwarf Erfurt.

CELERY

Early: Golden Self-blanching. (This variety may also be used for the late crop.)

Late: Winter Queen.

CUCUMBER

For slicing: White Spine, Davis Perfect.

For pickling: Boston Pickling, Fordhook Pickling.

EGGPLANT

Black Beauty, New York Improved.

ENDIVE

White Curled, Green Curled, Broad Leaved Batavian.

KALE

Green Curled.

KOHL-RABI

White Vienna, Purple Vienna.

LEEK

American Flag.

LETTUCE

Head

Early spring: May King, Mignonette.

Summer: Salamander, Hanson.

Fall: Big Boston.

Loose leaf: Grand Rapids.

Cos, or Romaine: Paris White.

(May King and Grand Rapids are adapted to forcing in the hotbed, but are also grown in the garden.)

MUSKMELON

Salmon flesh: Osage or Millers Cream, Emerald Gem.

Green flesh: Netted Gem, Hackensack.

OKRA

Dwarf Green.

ONION

For mature bulbs: Globe Danvers, Southport, Red Weathersfield, Ailsa Crag, Prizetaker.

For green onions from sets: Silver Skin, White Portugal.

FIG. 105. AN ESPECIALLY FINE HEAD OF CAULIFLOWER

FIG. 106. A PLATE OF CRISP LETTUCE

PARSLEY

Moss Curled, Double Curled.

PARSNIP

Hollow Crown.

PEAS

Early

Dwarf: Nott's Excelsior, American Wonder.

Half dwarf: Thomas Laxton, Gradus

Late

Dwarf: Stratagem.

Half dwarf: Advance.

Tall: Telephone.

(Dwarf, under 2 feet; half dwarf, 2 to 4 feet; tall, over 4 feet. These measurements apply only to plants grown in average soil; richer soils will naturally produce larger vines.)

PEPPER

Sweet (for stuffing or salad): Chinese Giant, Bull Nose, Ruby King.

Hot (for seasoning): Cayenne, Red Chili.

(The sweet and the hot peppers should not be grown together because they cross.)

POTATO

Early: Irish Cobbler, Early Rose.

Late: Green Mountain, Rural New-Yorker.

PUMPKIN

Sweet Sugar or Small Sugar.

RADISH

Early: Scarlet Globe (round red), White Icicle (long white), French Breakfast (cylindrical red with white tip).

Summer: White Strassburg (long white).

Winter: White Chinese or Celestial, Black Spanish.

RHUBARB

Victoria, Linnaeus. (Roots should be bought, because plants raised from seeds are variable.)

SALSIFY

Sandwich Island.

SPINACH

Savoy, or Bloomsdale; Long Standing; Viroflay. (New Zealand spinach may be grown for summer, as it will stand hot weather.)

SQUASH

Early: Crookneck, White Bush.

Late: Hubbard, Delicious.

SWEET CORN

Early: Golden Bantam (yellow), Cory (white).

Midseason: Metropolitan (white), Seymour's Sweet Orange (yellow) Black Mexican (bluish black).

Late: Evergreen (white), Country Gentleman (white).

(Early varieties may be planted every ten days to the first of July for a succession).

SWISS CHARD

Lucullus.

TOMATO

Early

Red: Bonny Best, John Baer, Chalk's Early Jewel.

Pink: June Pink.

Midseason

Pink: Livingston Globe.

Late

Pink: Ponderosa.

Red: Stone.

TURNIP

White Milan, Purple Milan, Rutabaga or Swedish turnip, Improved American.

WATERMELON

Coles Early.

FIG. 107. SWISS CHARD

SUCCESSION AND ROTATION OF VEGETABLE CROPS

When the growth habits of vegetables are known, the gardener may practice intercropping by planting quick-maturing crops of small size between those that are slow and require a large space in which to develop. Lettuce, radishes, and beets may be planted between such crops as cabbage or tomatoes.

Some vegetables require only a part of the season for their growth and may be followed by others. Early peas or early cabbage, for example, may be followed by late celery or late beets. This is called succession cropping. Full utilization of the garden is possible only where succession cropping is followed. Therefore the gardener should consider this factor in making his garden plan.

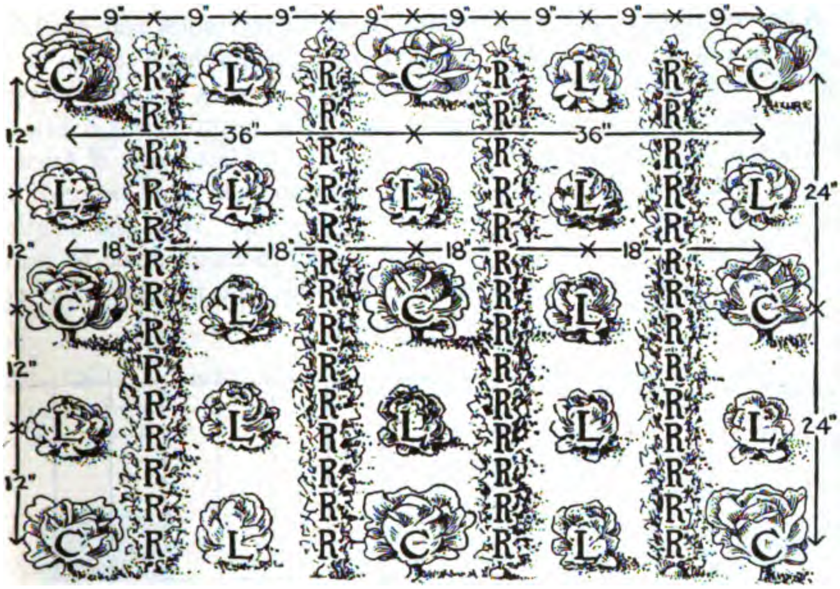

FIG. 108. A METHOD OF INTERCROPPING

All these crops are planted at the same time. The lettuce (L) and the radishes (R) mature before they are crowded by the cabbage (C)

The following lists of vegetables (table 1) arranged according to the time they occupy the ground, may be suggestive in working out plans for intercropping and succession cropping. Conditions of course will vary with climate and location. Long Island gardeners, for example, will have a greater range of combinations than gardeners in sections where the growing season is comparatively short.

TABLE 1. GROUPING OF CROPS

Crops that occupy the ground the entire season	Early crops that may be followed by others	Late crops that may follow others
Beans, lima (both bush and pole)	Beans, bush	Beans
Corn, late	Beets, early	Beets
Cucumbers	Cabbage, early	Cabbage, late
Eggplant	Carrots, early	Carrots
Melons	Corn, early	Cauliflower
Onions from seed	Lettuce	Celery
Parsnips	Peas	Corn
Peppers	Potatoes, early	Kale
Potatoes, main crop	Radishes	Lettuce
Pumpkins	Spinach	Peas
Salsify	Turnips	Spinach
Squash		Turnips
Tomatoes		

A harvest record indicating the dates on which vegetables were available for table use will aid in planning the garden for another year, so as to have a continuous supply thruout the season. Such a record of a very good home garden is shown in figure 109. This record shows a distinct shortage of produce during May, early June, and the latter part of August, but by replanning the garden probably more produce could be provided during the latter part of August in a normal year. With the addition of a coldframe and a hotbed, something besides radishes should be ready to harvest during May and early June. In this case the space was not large enough to grow vegetables for storage.

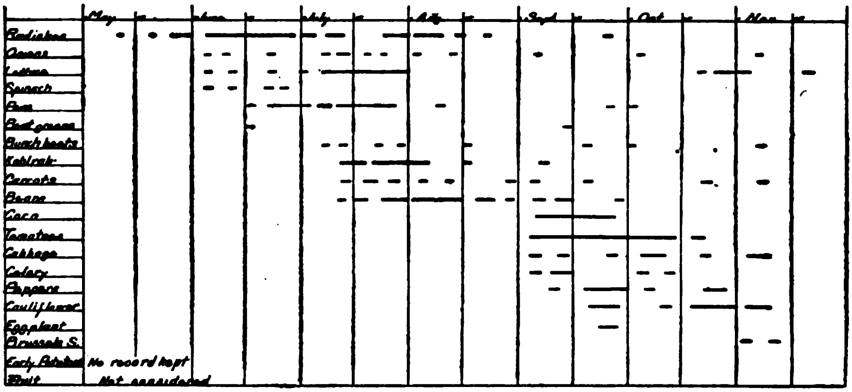

FIG. 109. A HARVEST RECORD

This shows the time the various vegetables were harvested from a garden 40x40 feet

SEED

The home gardener cannot afford to buy cheap seed. It is a good plan to order seed from catalogs of firms that gardeners in your community have found reliable. Many of the firms specialize in some particular vegetable — for instance, one has a good type of lettuce, another of squash, and another of tomato — and gardeners should take advantage of this fact. As a general rule only new seed should be used, but often left-over seed may give satisfactory results. The latter, however, should be tested, and if the germination is low should be discarded.

SEED TESTING

Testing seed before planting in the garden may often prevent disappointments later. Also by testing, the gardener learns what percentage of seeds will grow, which aids him in sowing. If germination is very poor, it is best to buy new seed. Of the smaller kinds, such as lettuce, 25 seeds

are generally tested, and 10 of the larger kinds, such as beans. Various homemade devices may be used for testing seeds; the plate and the glass tumbler germinator are both good.

The plate germinator is made as follows from two pie tins or dinner plates and some absorbent material, such as blotting paper, coarse wrapping paper, or cloth. In the bottom of one of the tins or plates, place several layers of the absorbent material, wet it thoroly, and scatter on it the seeds to be germinated. If plenty of absorbent is used, it will not be necessary to place a paper or a cloth over the seeds. Invert the second plate over the first as a cover, and fit the edges closely in order to make a tight, moist chamber. Keep the germinator in a room in which the temperature is 60 to 70°.

FIG. 110. TWO TYPES OF HOMEMADE SEED GERMINATORS

For small seeds, such as lettuce, an ideal germinator can be made as follows with a piece of glass, a glass tumbler, and some blotting paper. Cut two pieces of blotting paper so that they will just fit inside the tumbler. Lay these on top of each other on the piece of glass, wet them thoroly, and scatter on the top of the blotting paper the seeds to be germinated. Invert the tumbler over the blotting paper, and set the germinator in a warm place. As a rule no more water is needed, but if the blotting paper becomes dry, a little can be added. This type of germinator interests children because they can watch the germination as it progresses from day to day.

The seeds should be examined frequently and those that have sprouted should be taken out and counted. Any lot of seed which shows a low percentage of germination, at any given time, should be discarded, as slow sprouting indicates low vitality. A larger per cent of seed will sprout in the germinator than will produce plants in the garden,

AMOUNT OF SEED REQUIRED

Before ordering seeds or plants for the garden it is important to consider the size of the garden, the number of persons to be supplied, the methods of planting, and the kind of cultivation to be given. Most inexperienced gardeners order and plant more seed than is needed. This results not only in a waste of seed but also in extra labor of thinning, or else growth is seriously checked by crowding of the plants in the row. In table 2 is given the approximate amount of seed or number of plants necessary to supply a family of four with vegetables of various kinds; the amount of seeds, or number of plants required for 100 feet of row; and also suggestions regarding the distance of planting for both hand and horse cultivation.

TABLE 2. QUANTITY OF SEED AND NUMBER OF PLANTS NECESSARY FOR 100 FEET OF ROW, DEPTH OF PLANTING, AND DISTANCE OF PLANTING

Crop	Approximate quantity of seed required for family of four	Required for 100 feet of row		Distance between rows (feet)		Distance between plants in the row
		Seed	Plants	Hand cultivation	Horse cultivation	
Asparagus.......	....	1 ounce	60–80	2	3–4	12–15 inches
Beans						
Bush.........	1–2 quarts	1 pint	....	2	2½–3	3–4 inches
Bush lima.....	1 pint	½–1 pint	....	2½	3	6–10 inches
Poll lima	1 pint	½ pint	....	3	4	3–4 feet
Beet............	4 ounces	2 ounces	....	1–1½	2–2½	3–5 inches
Cabbage						
Early.........	1 packet	1 packet	65–90	2–2½	2½–3	14–18 inches
Late	½ ounce	½ ounce	65–90	2–3	2½–3	14–18 inches
Carrot..........	1 ounce	1 ounce	....	1–1½	2–2½	2–3 inches
Cauliflower......	1 packet	½ ounce	60–75	2–2½	2½–3	15–18 inches
Chard..........	1 ounce	1 ounce	....	1½–2	2½–3	6–10 inches
Celery..........	1 packet	½ ounce	200–250	1½–2	3–4	4–6 inches
Corn, sweet.....	1–2 pints	½ pint	....	2½–3	3–3½	10–12 inches
Cucumber.......	½ ounce	½ ounce	50–70	4–5	4–5	Drills, 18 inches Hills, 5 feet
Eggplant........	1 packet	½ ounce	50–70	2–3	3	1½–2 feet
Kale............	2 ounces	½ ounce	....	1½–2	2½–3	8–10 inches
Lettuce.........	½ ounce	½ ounce	125–200	1–1½	2–2½	6–10 inches
Muskmelon.....	½ ounce	½ ounce	50	5–6	5–6	Drills, 2 feet Hills, 5 feet
Onion						
Seed.........	....	1 ounce	....	1–1½	2	3–4 inches
Sets..........	4–6 quarts	2 quarts	....	1–1½	2	3–4 inches
Parsley.........	1 packet	½ ounce	....	1–1½	2	3–4 inches
Parsnip.........	½ ounce	½ ounce	....	1¼–1½	2–2½	3–4 inches
Peas............	2-4 quarts	1–2 pints	....	2–3	3–4	1 inch
Pepper..........	....	1 packet	50–70	2–3	3–3½	1½–2 feet
Potato..........	....	5–6 pounds	....	2½–3	2½–3½	12–18 inches
Radish..........	1 ounce	1 ounce	....	1–1½	2	1 inch
Rhubarb........	....	....	30–50	2–3	3	2–3 feet
Salsify.........	1 ounce	1 ounce	....	1–1½	2	2–3 inches
Spinach.........	½ pound	1 ounce	....	1–1½	2	2–4 inches
Squash						
Bush.........	½ ounce	½ ounce	....	3–4	3–4	Drills, 15–18 inches Hills, 4 feet
Vine..........	½ ounce	½ ounce	....	8	8	Hills, 8 feet
Tomato						
Early.........	1 packet	½ ounce	35–50	2–3	3–4	2–3 feet
Late..........	½ ounce	½ ounce	35–50	2–3	3–4	2–3 feet
Turnip..........	2–3 ounces	½ ounce	....	1–1½	2	3 inches
Watermelon.....	1 ounce	1 ounce	30–35	8–10	8–10	Drills, 3 feet Hills, 8 feet

GARDEN TOOLS

Only the better grade of garden tools should be bought. Light, cheap tools usually break when put to hard service. In the average home garden, a spade, a hoe, a rake, and a line are essential. Other tools that are desirable and may be added as the gardener needs them are: shovel, wheel hoe, wheelbarrow, trowel, watering can or hose, spray outfit, hand weeder, and spading fork.

FIG. 111. GARDEN TOOLS

Spading fork, flat trowel, and weeders are useful but not essential. The spade, rake, line and hoe are essential

GROWING EARLY PLANTS

Many home gardeners buy their plants of early lettuce, cabbage, tomatoes, early celery, and peppers from local growers or merchants. These plants may be grown at home, however, in the house in boxes or in a hotbed or a coldframe, if the gardener is willing to give attention to details.

BOXES

Boxes from 2½ to 3 inches deep are best for growing most young plants (fig. 112), and may be made at home from other boxes or from odds and ends of lumber. Drainage is usually provided for by making the

bottom of the box of slats, spaced from $\frac{1}{8}$ to $\frac{3}{16}$ of an inch apart. As a further provision for drainage a layer of coarse soil should be placed in the bottom of the box. A sheet of newspaper placed on the slats before the soil is put in, will prevent it from falling thru the cracks and at the same time will allow surplus water to escape.

For filling the box, good, moist, friable garden soil containing a large proportion of coarse sand should be used. If necessary the soil should be moistened some time before filling the box. Soil is of the proper moisture content for sowing seeds when a handful of it can be pressed into a ball that crumbles readily when touched. The soil in the box should be firmed, and the surface should be level and from $\frac{1}{4}$ to $\frac{1}{2}$ inch below the top of the box. If small seeds, such as those of celery and lettuce, are

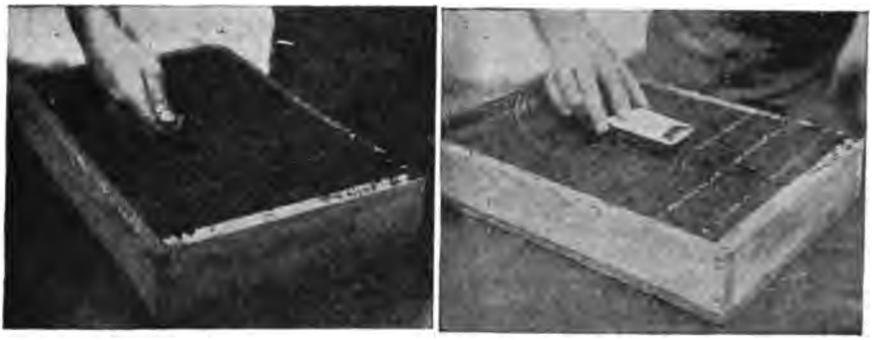

FIG. 112. TWO METHODS OF SOWING SEED

to be sown, it is well to screen the top half inch of soil thru a sieve of $\frac{1}{4}$-inch mesh.

The seed may be sown either in drills or broadcast. The latter can be done more rapidly, but drilling is generally preferred, for the soil between the rows may be stirred, and the plants are usually more stocky and are more easily removed for transplanting. For drilling, the box should be marked off into furrows about 2 inches apart and of the following depth for the various seeds: tomato, $\frac{1}{8}$ to $\frac{1}{4}$ inch; onion, $\frac{1}{4}$ inch; pepper and eggplant, $\frac{1}{8}$ to $\frac{1}{4}$ inch; cabbage, cauliflower, brussels sprouts, kohl-rabi, $\frac{1}{4}$ inch; lettuce, $\frac{1}{8}$ inch; celery, barely covered with soil or covered with moist cheesecloth.

After the seeds are planted, the box should be heavily watered with a fine spray until all the soil is thoroly moist. It is a good plan to dig down to the bottom of the box and see whether enough water has been applied. Oftentimes the top layer may be soaked, while the bottom remains dry.

Most beginners and some experienced gardeners have more trouble in watering properly than in any other operation in growing young plants.

The box should be placed near a south or southeast window in a room in which the temperature is best suited for the kind of plant that is being grown. Onions, cabbage, cauliflower, brussels sprouts, kohl-rabi, celery, and lettuce grow best in a temperature of from 40° to 50° F. at night, and from 55° to 65° F. during the day. Tomatoes, peppers, and eggplant grow best in a temperature of from 65° to 68° F. at night and 70° to 80° F. during the day.

The box should be turned each day as soon as the plants appear; otherwise they will grow unevenly and become spindling. In order to grow, plants must have light, air, water, and plant food; therefore the seedlings should receive as much sunlight as possible and the soil between them should be stirred frequently so that water will soak in readily. Watering in early morning gives the surface of the soil and the plants opportunity to dry off during the day. A watering can with a fine rose is best for use with young plants.

HOTBEDS AND COLDFRAMES

Only a rather limited number of plants can be grown in the house in boxes, but if a hotbed and a coldframe are available a greater variety of crops may be produced. Also some quick-maturing crops, such as early onions, radishes, and lettuce. A two-sash hotbed is ample for starting plants for the medium-sized garden, and a coldframe of equal size will be found convenient. If crops are grown to maturity in the frames, more space will be required.

If possible, hotbeds and coldframes should have a southern exposure and should be protected from prevailing winds by a house, a hedge, or some other windbreak.

The standard hotbed sash is 3 feet wide and 6 feet long, altho other sizes may be bought. Sash may be either single or double glazed, depending on whether they have one or two layers of glass. Single-glazed sash, the more common kind, are lighter to handle, cheaper, and easier to keep clean, than the doubled-glazed; the latter, however, have the advantage of furnishing better protection in cold weather. For protection at night, straw mats or old pieces of carpet may be laid over the sash. Sash covering of lath is sometimes used to shade the beds on sunny days.

There are three methods of heating hotbeds: by the use of fermenting manure, by hot water and steam, and by hot-air flues. The last two methods are used only in commercial gardening on a large scale. For

the small market garden and the home garden, the manure-heated bed is the most practicable and the most easily constructed. A cross section of such a hotbed in which the manure is placed below the surface of the ground, is shown in figure 114. When the bed is constructed in this form, it is called a permanent hotbed; when the manure is placed on top of the ground and the frame for supporting the sash set on this, it is known as a temporary hotbed.

For making the permanent hotbed the first operation is digging the pit from 24 to 36 inches deep, 6 feet long north and south, and as wide east and west as required by the number of sash used. If one sash is used, the pit would be 6 feet north and south and 3 feet east and west; if four sash are used, the pit would be 6 feet north and south and 12 feet east and west.

FIG. 113. A FOUR-SASH HOTBED

After the pit has been dug, a stake of 2x4-inch lumber should be driven at each corner, and, in the case of a long range of beds, at intervals of 6 feet along each side. The top of the posts on the south side of the bed should be 6 inches below the top of those on the north side, so that the sash will have a fall of 6 inches. The pit should be lined with two thicknesses of 1-inch boards, closely fitted without openings or holes that would admit cold air. As a support and brace, the top piece of lining should be of 2x6-inch lumber. Concrete instead of lumber may be used for lining the pit and is of course more durable. A concrete bed, however, requires more manure to heat it than does one lined with wood.

As soon as the pit is lined, it is ready to be filled. Layers of fresh horse manure that contains about half straw and that has been brought to a uniform temperature by being turned over a few times, should be put in until the pit is filled to within 4 inches of the surface of the soil on the outside. Each layer should be tramped down and well firmed, especially

in the corners and along the sides. On top of the manure should be placed 4 to 6 inches of rich, friable, garden loam. The surface of this soil should be 6 inches below the top of the frame on the south and 12 inches below the top of the frame on the north. For the first few days after the manure has been placed in the hotbed the temperature will be very high, and not until it has dropped to between 85° and 90° F. and become steady should any seeds be planted. During this time the bed should be ventilated in order to permit the escape of gases generated by the fermenting manure.

For the temporary hotbed, the manure is piled on top of the ground instead of being placed in a pit. The frame for supporting the sash,

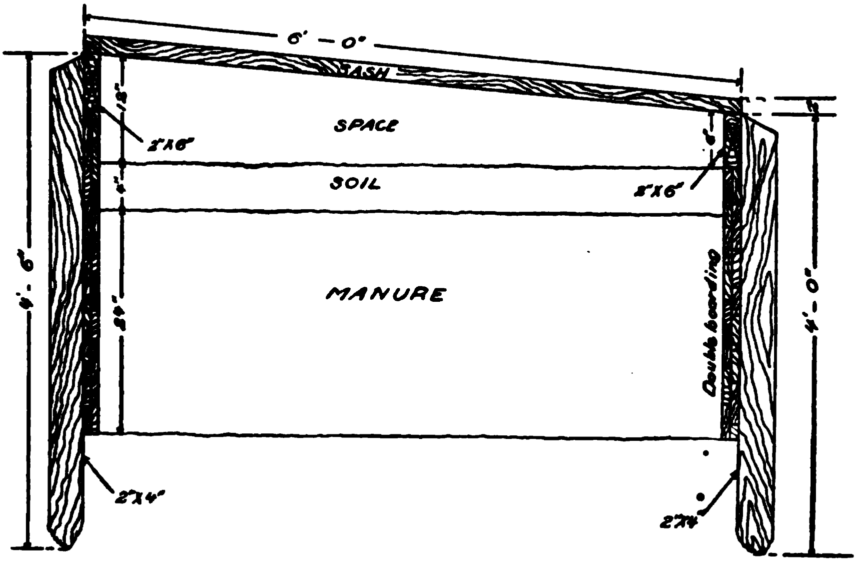

FIG. 114. CROSS SECTION OF A MANURE-HEATED HOTBED

which should be 12 inches deep on the south side and 18 inches deep on the north, is placed on the manure, and garden soil is added as in the case of the permanent bed. The frame should be banked all around with manure to keep out cold air and to keep in the heat that is generated by the manure.

The seed may be planted in boxes as already described (page 294) and these placed in the hotbed, or it may be sown directly in the hotbed soil. In the latter case, the rows should be from 3 to 6 inches apart, depending on the kind of vegetable and the time the plants are to remain in the bed.

In general, seeds should be sown in the hotbed from 6 to 12 weeks before the plants can be set out of doors. A guide for the date of planting vegetable seed under glass and the optimum temperature for the hotbed

on cloudy days is given in table 3. When the sun is shining, the temperature will rise accordingly. During the day the temperature should be kept 10° higher than that given in the table.

The construction of the coldframe is similar to that of the hotbed except that no means of heating is provided. The frame for a two-sash

FIG. 115. COLD FRAMES ARE USED FOR HARDENING-OFF EARLY PLANTS AND FOR GROWING A FEW EARLY CROPS TO MATURITY

coldframe with the sash removed is shown in figure 116. For covering the coldframe, muslin-covered sash is sometimes used in place of glass; however, muslin does not provide so much protection from cold as does glass and is less transparent.

The frame is usually made of 2x6-inch or 2x8-inch lumber with the back board 6 inches higher than the front so that the sash will slope. If

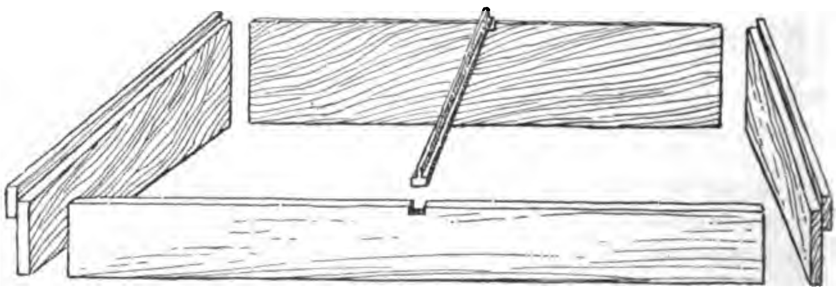

FIG. 116. A TWO-SASH COLDFRAME SHOWING DETAILS OF CONSTRUCTION

two or more glass sash are used, supporting bars, or crossties, should be placed every 3 feet apart (fig. 115). If the frame is to be covered with muslin, these bars may be farther apart and the muslin unrolled over the entire frame, or the muslin may be tacked on light frames 3x6 feet in size and handled in the same way as glass sash. The outside of the frame may be banked with straw or manure.

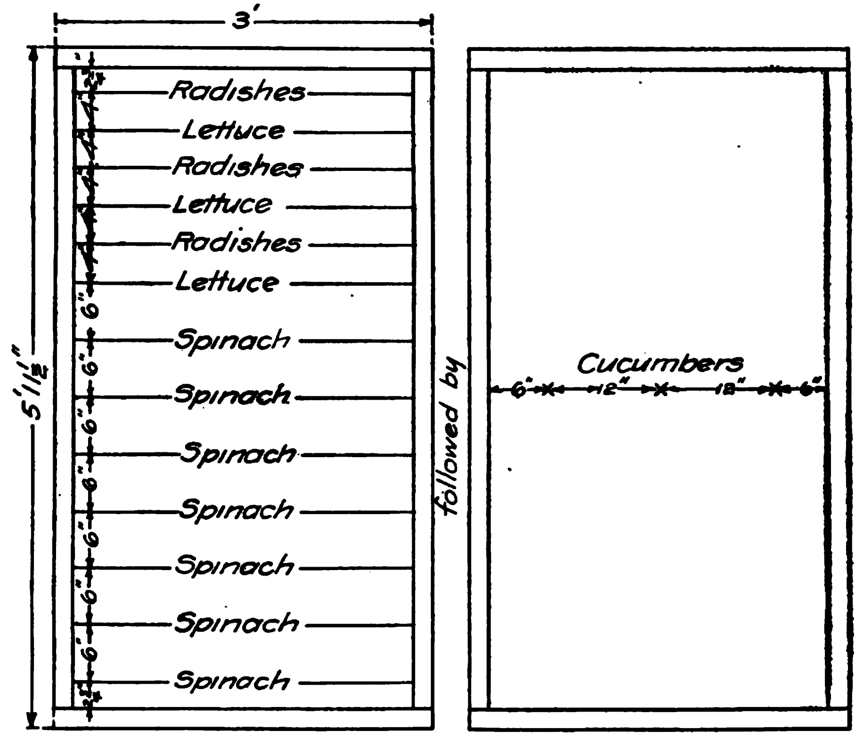

FIG. 117. A GOOD PLAN FOR A ONE-SASH BED WHERE VEGETABLES ARE TO BE RAISED FOR IMMEDIATE CONSUMPTION

TABLE 3. SEEDS SOWN UNDER GLASS

Vegetable	Date to sow	Approximate temperature (degrees F.)	Number of days required to germinate
Beet	March 15 to April 1	55°	7 to 10
Brussels sprout	March 1 to April 1	55°	3 to 7
Cabbage	March 1 to April 1	55°	3 to 7
Cauliflower	March 1 to April 1	55°	3 to 7
Celery	March 15 to April 15	50°	10 to 25
Cucumber	March 15 to May 1	75°	5 to 10
Eggplant	March 1 to April 1	75°	7 to 14
Kohl-rabi	March 1 to April 1	55°	3 to 6
Lettuce	February 15 to April 1	55°	3 to 6
Muskmelon	April 15 to May 1	75°	5 to 10
Onion	January 15 to March 15	50°	7 to 15
Pepper	March 1 to April 15	75°	7 to 12
Squash	March 15 to April 15	75°	5 to 10
Tomato	March 1 to April 15	75°	5 to 10
Watermelon	April 1 to May 1	75°	5 to 10

The most common use of the coldframe is for hardening-off plants grown indoors or in the hotbed. If it is used to grow crops to maturity, very fine rich soil should be provided.

VENTILATION

Plants grown under glass should be given as much air as possible while maintaining the required temperature; they should not of course be allowed to become chilled. This may be done by opening the frames early on bright sunny mornings and closing them in the afternoon before the sunlight is off the glass. Sash should always be opened on the side away from the direction in which the wind is blowing. On very bright warm days or during warm rains, the sash may be removed entirely. A stick notched so that the width of the opening may be suited to outside conditions is very useful in ventilating frames. If temperatures go low enough to freeze the plants, some protection, such as straw mats or old carpet, should be placed on the frames. During February, March, and April, such covering will have to be placed over the frames every night. As the weather becomes warmer, the frames should be ventilated more and more; and for several days before the plants are set in the garden, they may be left uncovered day and night.

TRANSPLANTING

There is no set rule that can be followed in transplanting, because the kind of plants, the time desired to set them outdoors, and growing conditions in the house or under glass must all be considered. With most kinds, the first transplanting is made when the third leaf is well formed. If seedlings are allowed to crowd, they become spindling and rarely develop into good plants.

For transplanting, tin cans or berry boxes may be used as individual containers. With the cans, it is well to provide means of drainage by punching holes in the bottom. A thin layer of gravel or a few stones placed in the bottom of the can will prevent the soil from washing thru the holes. The soil should be kept moist, but not wet. Growing plants in boxes or cans insures a sturdy root development, and they may be transplanted to the garden with the ball of earth intact. Plants should be thoroly watered immediately after transplanting.

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144 How the plant produces seed
38 Principles and methods of plant breeding
129 Improving the corn crop by selection and breeding
44 Methods of breeding oats

THE SOIL

74 Introduction to the principles of soil fertility
42 Tilth and tillage of the soil
70 Soil moisture and crop production
78 Land drainage and soil efficiency
50 Nature, effects, and maintenance of humus in the soil
141 Farm manure: its production, conservation, and use

FARM CROPS

143 Potato growing in New York
66 Meadows in New York
90 Alfalfa for New York
110 Buckwheat
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108 Culture of sweet clover and vetch

LIVESTOCK

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114 Silos, and the production and feeding of silage
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DAIRYING

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82 Cream separation
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60 Farm butter-making

98 Practical examples in dairy arithmetic
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96 The surroundings of the farm home
59 Sewage disposal for country homes

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LESSON 146 LIVESTOCK SERIES JUNE, 1919

THE PROBLEM OF TUBERCULOSIS IN CATTLE

DISCUSSION PAPER

The discussion paper takes the place of the teacher in encouraging thought and self-expression on important points in the lesson, and aims to assist the reader in reviewing and applying them. Each discussion paper filled out and returned is read carefully, and a personal reply is made to questions on any agricultural subject. In order to continue a course, the reader should sign and return the discussion paper so that another lesson may be sent. Questions are included on the discussion paper for the purpose of assisting those readers who desire to give the lesson special study. The preparation of answers is optional.

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(*Detach, sign, and return for the next lesson in this series.*)

(*In answering questions, attach additional paper if needed and number the answers.*)

1. What are some of the symptoms of bovine tuberculosis?

2. How may tuberculosis spread?

3. How may its spread be prevented?

4. What is the accredited-herd plan?

5. What are some of the methods of detecting tuberculosis in cattle?

6. What are some of the limitations of the tuberculin test?

7. What would you advise doing with reactors in a valuable dairy herd?

8. Describe the Bang method of handling tuberculosis.

9 How may tuberculosis be eradicated from a herd?

10. How may a herd be kept free from tuberculosis?

Name...

Address..

Date...

(Address all correspondence to the Reading Course for the Farm, College of Agriculture, Ithaca, New York.)

THE CORNELL READING COURSE FOR THE FARM HOME

PUBLISHED BY THE NEW YORK STATE COLLEGE OF AGRICULTURE AT CORNELL UNIVERSITY, ITHACA, NEW YORK
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AUGUST, 1918 RURAL LIFE SERIES LESSON 120

CIVIC DUTIES OF WOMEN

BLANCHE EVANS HAZARD

THERE is no longer before women or men in New York State the question of deciding for or against woman's suffrage. The decision has been made in the affirmative. Now the question is the preparation of all New York women, whether they live in city or country, up state or down state, for voting intelligently and righteously. A wide field for study and comprehension is open to women voters.

There are three phases of public thought and action to be considered by the New York State woman in preparation for voting: (1) the political, (2) the industrial and social, (3) the world, or international. For each of these phases, women may find many facts and explanations accessible and easily comprehended, if they devote enough time and labor to following thru the programs suggested in this publication. To this request for time and labor on the part of busy home makers, the answer may come that their families already so absorb their energies that, however willing, they dare not assume larger responsibilities. Yet no woman of health and normal tendencies has ever refused to take care of her family, and this can no longer be done by merely attending to the household affairs under her own roof or by being interested merely in village concerns.

The family is a working, integral part of town, county, state, nation, and world. The laws and regulations that affect the family of any woman may be made by any one of these groups. Happily, the very year in which the New York home maker's family has gone farthest afield — to the trenches of France, over the ocean guarded until the beginning of the

Great War by international law—the mother, the wife, or the sister has a chance to share in making and administering such laws and regulations. She must be willing then to make the effort to follow her family out from under her roof. Her natural instincts and sympathies make her ready and eager to care for the city, the county, the state, and the nation. She must concern herself with camps and railroad systems, with parks and amusement halls, with sewerage, and with the moral sanitation and educational problems of city and village.

Already the New York woman has risen to the school problem and gained experience in voting on it. Altho in New York State this has been the limit of her legal voting, she has already served in city reform groups, slum settlements, Consumers' Leagues, Young Women's Christian Associations, Traveler's Aid Societies, and other such organizations, the work of which is now being taken over gradually by the civic authorities because their need was demonstrated while they were philanthropic experiments. Women, therefore, altho just given the power to vote in this State, are not on the threshold of public experience. They have much to learn, however, and the aim of this publication is to guide them and to provide material for study.

PLAN OF PROGRAMS

The course here outlined may cover an entire winter's study, or a month of daily intensive work may be undertaken by leaders who in turn will direct clubs or town groups.

The political phase, which is covered by a study of civics, or civil government, as it is usually taught in the upper grammar grades and in high schools, is naturally placed first. It is the more technical and perhaps the more familiar phase to women who have always heard men talk about voting and issues.

Following the political phase is a consideration of social and industrial conditions, which previous to the twentieth century were left to individuals or to philanthropic endeavor for solution. Since the State has gradually taken over these problems, and since all men and women in the nation are concerned with them not only as individuals but also as voting citizens, all women voters need to study and comprehend them.

In these years when this nation is playing a deciding part in world affairs, there is no need to urge interest in foreign politics. Even the word *foreign* now seems out of place. Since the participation of America in the World War, there is a feeling that the shores of England, France, and Italy are nearer than ever before. An intimate knowledge of European life both before and during the Great War will be necessary to the voters of the future in order to deal wisely with the reconstruction problems and to work out details for permanent peace.

Lists of necessary reference books, costing so little that they can be obtained one way or another, are given on pages 39 and 40. These are books that would be gladly received in any school or local library at the end of the club year.

PART I. POLITICAL PHASE

The outline for the study of local and state government in New York and of the Federal government is based directly on Hoxie's *Civics for New York State*, a simple but adequate textbook. Definite page references are given for each large topic. Additional references are suggested for enlargement of views and for fuller details in two standard books, Young's *The New American Government and Its Work* and Guitteau's *Government and Politics in the United States*. When references are consulted for details, the club members should make out notes from the text to aid in fixing the facts in mind.

It is hoped that each student-voter will own a copy of Hoxie's *Civics for New York State* and that each group will buy a small library costing from five dollars to fifteen dollars, as suggested on pages 39 and 40. Members of the club should send to the Secretary of State at Albany for a copy of the New York State Constitution with revisions to date and for sample copies of bills prepared for a second reading and discussion in the Assembly. Papers connected with town, county, and city government should be collected and studied. Talks with local and state officials about everyday phases and details of politics will be of value as practical education for voting. A good presentation of politics, with reference to lobbying, grafting, and bosses, is given in Ray's *An Introduction to Political Parties and Practical Politics*.

PROGRAM 1

INTRODUCTION TO THE PREPARATION OF WOMEN FOR VOTING

I. Reasons for preparation for voting:
1. It is woman's duty now to vote.
2. The ignorant vote hinders progress.
3. Women, like men, must give time for intelligent study and thought in order to vote wisely.
4. An all-round interest in the various phases of public life — political, social, industrial, and international — is necessary.
5. This interest and intelligence must first be acquired and then constantly increased.
6. Even the busiest housekeepers in New York will serve their families better by helping to improve conditions in the community, the state, and the nation, in which they live.

II. Means of preparation for voting:

1. Books on (1) civil government and practical politics, (2) labor problems and suggested solutions, (3) social problems and suggested solutions, (4) world conditions, ideals, and needs.
2. Newspapers and periodicals.
3. Lectures by officials who can speak from experience, and by students of political, social, and international affairs.
4. Conversation with officials and with persons interested in following public affairs.
5. Correspondence courses or classes in institutions or in clubs under leaders who give much or all of their time to study and contact with public affairs.

PROGRAM 2 (LOCAL GOVERNMENT)

TOWNS IN NEW YORK STATE

I. Definition of town.

II. Government of a town:

1. Direct government for every town. Every voter shares directly in the government in town meeting. Government in all other political units has to be indirect; for example, the law-making bodies of a city, a county, a state, and the United States are the board of aldermen, the board of supervisors, the legislature, and Congress, respectively.
2. Departments of town government:
   a. Legislative (voters make town by-laws).
   b. Executive (supervisor, town clerk, constables, and other officers).
   c. Judicial (four justices of the peace, chosen for four years to hear cases of people accused of petty offenses and suits involving less than two hundred dollars.)
3. Officers of town: assessors, collector of taxes, supervisor, town clerk, superintendent of highways, overseers of the poor, constables, election inspectors. (See details of duties for each officer, *Civics for New York State*, Chapter III.)

III. History of the development of the town and the town meeting in Anglo-Saxon England, and in colonial America among the Pilgrims and Puritans in New England and the Dutch in New York. (*Civics for New York State*, p. 18–21.)

IV. A study of the activities of a town, with the aid of an official, if possible. Collection of town records and official printed documents.

REFERENCES

Civics for New York State, Chapters I–III. Charles DeForest Hoxie. American Book Company. 1916.
The American commonwealth, Vol. I, Chapters XLVIII and XLIX. James Bryce. The Macmillan Company. 1910.
Government and politics in the United States, Chapter II. William Backus Guitteau. Houghton Mifflin Company. 1911.

PROGRAM 3 (LOCAL GOVERNMENT)

VILLAGES IN NEW YORK STATE

I. Definition of village: a settlement within a town organized under a charter.
II. Advantages and needs of village organization.
III. Legislative body: village board of trustees, two to eight in number, elected by voters. (*Civics for New York State*, p. 36–37.)
IV. Executive officers of a village: their powers and duties. (*Civics for New York State*, p. 37–38.)
 1. Elected by voters to serve one year: president, treasurer, collector, assessors.
 2. Appointed by board of trustees: clerk, street commissioner, village engineer, board of health (three to seven members), and health officer.
V. The judiciary department: police justice with the court of special sessions.
VI. Four classes of villages. (*Civics for New York State*, p. 35–36.)
VII. New conditions made necessary by villages as centers of population. Consider in each case whether these should be matters of public or private enterprise:
 1. Paved roads.
 2. Sidewalks and curbs.
 3. Sewers.
 4. Street lights.
 5. Water supply.
 6. Fire department.
 7. Care of public health.
 8. Removal of refuse.
 9. Street cleaning.
 10. Graded and higher schools.
 11. Care of stray animals.

REFERENCE

Civics for New York State, Chapter IV. Charles DeForest Hoxie. American Book Company. 1916.

PROGRAM 4 (LOCAL GOVERNMENT)

CITIES IN NEW YORK STATE[1]

I. Definition of city: a village grown so large that its public activities are highly organized and complex.

II. Development of special forms of city government; history of city charters and institutions in medieval England, in the Netherlands, and in colonial New York.

III. Classes of cities in New York State:
1. First class: population of 175,000 and over.
2. Second class: population of 50,000 to 175,000.
3. Third class: population under 50,000.

IV. Legislative department:
1. Board of aldermen or common council, elected from the wards of the city for two years.
2. Powers of aldermen similar to those of citizens in town meeting, for example, granting of franchises and licenses, fixing tax rates, and the like.

V. Executive department:
1. Mayor: the chief executive officer, elected by voters of the the entire city.
   a. Duties: control of police force, veto or approval of city ordinances, and the like.
   b. Power of appointment.
2. Other executive officers: treasurer, assessors, tax collectors, auditors, corporation counsel, street commissioners, park commissioners, superintendent of schools.

VI. Judicial department: (Most city courts are inferior to county and State courts.)
1. Courts for criminal cases.
2. Courts for civil suits.
3. Juvenile courts.

VII. Limitations on city governments by State or Federal constitution and by city charters; for example, limit made by State constitution on indebtedness.

VIII. Commission form of city government:
1. Main object.
2. Advantages claimed for it.
3. Experiments in Galveston, Texas; Lowell, Massachusetts; Denver, Colorado.

IX. City manager plan.

[1] A further study of city problems is given in Program 22, p. 33.

X. Some city problems:
1. Public ownership of public utilities, such as lighting plants and street railways.
2. Street sewers, curbs, and pavements. Wise public economy; consideration of lasting worth rather than present expense.
3. Profit-paying public institutions. Shall licenses be high or low? How thoroly shall they be inspected?
4. Buildings. Site and height of factories, stores, offices, and dwellings.
5. Parks, museums, and hospitals. How much public money should be spent on them? What restrictions should there be in the use of them?
6. The annual budget and the proper proportionment of city funds.
7. The rising taxation. Where is the limit?
8. Town planning: zones.
9. The "boss" in city government. What shall be done with him? (*An Introduction to Political Parties and Practical Politics*, Chapter XVI.)

REFERENCES

Civics for New York State, Chapter V. Charles DeForest Hoxie. American Book Company. 1916.
The American commonwealth, Volume 1, Chapters L to LII. James Bryce. The Macmillan Company. 1910.
Government and politics in the United States, Chapters IV–VI. William Backus Guitteau. Houghton Mifflin Company. 1911.
American municipal progress, Chapter XIX. Charles Zueblin The Macmillan Company. 1916.
American city government, Chapters II–V. Charles A. Beard. The Century Company. 1912.
An introduction to political parties and practical politics, Chapter XVI. P. Orman Ray. Charles Scribner's Sons. 1917.

PROGRAM 5 (LOCAL GOVERNMENT)

COUNTIES IN NEW YORK STATE

I. Sixty-two counties in New York; formed by State Legislature.
II. History of counties in England in Anglo-Saxon days.
III. County: a body politic, similar to a town; therefore it can sue and be sued in courts.
IV. Legislative department: board of supervisors consisting of representatives from each town and city ward. Each supervisor, elected by his town or city ward, has a term of two years and is a town or city officer as well as a county officer. He receives a salary of four dollars a day; his duties are fixed by State law.

V. Executive department: County officers are sheriff, district attorney, county clerk, treasurer, superintendent of the poor, and coroners, elected by voters of the entire county on the Tuesday following the first Monday in November, for a term of three years. Their duties are to administer county affairs and to act as agents of the State in enforcing State laws within the county.

VI. Judicial department:

1. A court for the trial of criminal and civil suits.
2. A surrogate court for probate.
3. The county judge. The county judge presides over the county court and has jurisdiction over all crimes against persons and property, except murder, and civil suits when the sum sued for does not exceed two thousand dollars. He is elected for six years by the voters of the county.

VII. Comparison of New York counties with New England counties.

VIII. County finances.

REFERENCES

Civics for New York State, Chapter VII. Charles DeForest Hoxie. American Book Company. 1916.

The American commonwealth, Vol. I, Chapters XLVIII and XLIX. James Bryce. The Macmillan Company. 1910.

Government and politics in the United States, Chapter III. William Backus Guitteau. Houghton Mifflin Company. 1911.

PROGRAM 6 (STATE GOVERNMENT)

THE STATE EXECUTIVE DEPARTMENT

I. History of executive power among Anglo-Saxon kings.

II. History of the early governors of New York.

III. Governor of modern New York:

1. Election: chosen by the voters of the State, in even years, by plurality vote for a term of two years, at a salary of $10,000 annually.
2. Qualifications.
3. Limitations of powers and privileges imposed by the State constitution — the "people's chief servant" not "the responsible head."
4. Duties and powers. (*Civics for New York State*, p. 166–167.)

IV. Lieutenant governor. (*Civics for New York State*, p. 167–168.)

V. Other executive officers of New York State. (*Civics for New York State*, p. 168–170, 173–175, 366–367.)

1. Elective: secretary of state, comptroller, treasurer, attorney general, state engineer and surveyor. Powers, salary, and duties of each. (*Civics for New York State*, p. 168–170, 366–367.)

2. Appointive: superintendent of public works, superintendent of banks, superintendent of insurance, superintendent of state prisons, three tax commissioners, ten public service commissioners, one commissioner of agriculture, and others.
3. State boards and commissions (complete list in State manual):
   a. State industrial commission.
   b. State board of medical examiners.
   c. Military training commission and armory commission.
   d. State printing board.
   e. State commission of prisons.
   f. Public service commission.

VI. The State militia and the national guard. Changes since 1914.

VII. The civil service of the State.

VIII. Dangers and advantages of divided executive powers.

REFERENCES

Civics for New York State, p. 165–177, 366–367. Charles DeForest Hoxie. American Book Company. 1916.

The American commonwealth, Vol. 1, Chapter XLI. James Bryce. The Macmillan Company. 1910.

Government and politics in the United States, Chapters VII and X. William Backus Guitteau. Houghton Mifflin Company. 1911.

The new American government and its work, Chapters XVI, XVII, XXIV, and XXVIII. James T. Young. The Macmillan Company. 1917.

An introduction to political parties and practical politics, Chapters IV, V, and IX. P. Orman Ray. Charles Scribner's Sons. 1917.

PROGRAM 7 (STATE GOVERNMENT)

THE STATE LEGISLATIVE DEPARTMENT

I. Review of meaning and functions of legislative department of any political unit — village, county, or state.

II. Development of the State legislature; reasons for two houses.

III. Constitution of New York State, the source of authority.

IV. Senate:
1. Number of senators generally fifty.
2. Members chosen from senate districts at a salary of $1500 a year paid from the State treasury. (*Civics for New York State*, p. 149.)
3. Qualifications of senator: twenty-one years of age or over; a citizen of the State holding no other public office.
4. Place of meeting, the senate chamber in the State Capitol at Albany.
5. Organization of the senate. (*Civics for New York State*, p. 153.)

6. Presiding officer, the lieutenant governor, who has no vote except in case of tie vote. Why?
7. Officers, elected or appointed, such as clerk and doorkeeper.
8. Quorum, a majority of the senators.
9. Caucuses and party leaders in the senate.

V. Assembly:

1. Members chosen from assembly districts at a salary of $1500 a year. Representation of counties. (*Civics for New York State*, p. 151–152.)
2. Presiding officer, the speaker, who has a vote. Why?
3. Place of meeting, the assembly room at the State Capitol.
4. Qualifications of assemblymen the same as those of senators.
5. Organization of the assembly. (*Civics for New York State*, p. 153.)
6. Officers, elected or appointed.
7. Quorum, a majority of the assemblymen.
8. Caucuses and party leaders in the assembly.

VI. Danger of legislatures misrepresenting the people of the State. Proposed reforms known as the initiative and the referendum. (*Civics for New York State*, p. 146–147.)

VII. Amendments to the New York State Constitution made in recent constitutional conventions.

VIII. Enactment of laws — general procedure:

1. Bill prepared. Legislative reference departments.
2. Bill introduced in the assembly by a "sponsor," or by any member in the senate.
3. Bill first read by title; then printed and sent to a committee for consideration and public hearings; lobbyists and their work.
4. Bill reported favorably or unfavorably.
5. Bill debated, section by section.
6. Bill passed on second reading; printed in new form; passed by one house and then by the other. Defeat.
7. Veto; passing over veto.
8. How are laws declared unconstitutional and therefore void?

IX. Committees of the State legislature:

1. Functions and composition of each. (*Civics for New York State*, p. 153–154.)
2. Number of members: from five to fifteen in each.
3. Advantage of such committees.
4. Standing committees: finance, judiciary, city affairs, canals, commerce, and others.

5. Special committees appointed as need arises, for example, investigation committees.
6. Committee of the whole (entire senate or assembly) debates a bill, with strict formal rules laid aside.

X. Restrictions imposed on the State legislature:
1. By the State constitution.
2. By the United States constitution.

XI. Freedom of speech in the legislature; its history and importance.

XII. Power of legislature to impeach and remove public officers.

XIII. Joint power of the legislature and the governor in appointments. Why is this considered a weakness? (*The New American Government and Its Work*, p. 315–316.)

XIV. Control of State finances by the legislature, including expenditures for charities, business, woman and child labor, education, highways, health, control of adulteration of foods, water supply, city charters, and transportation within the State.

XV. Investigation of executive departments and officials, by the legislature thru such means as civil service and public service commissions.

REFERENCES

Civics for New York State, Chapters XIII and XIV. Charles DeForest Hoxie. American Book Company. 1916.
The new American government and its work, Chapters XVII–XXII, XXIX, and Appendix B. James T. Young. The Macmillan Company. 1917.
The American commonwealth, Vol. I, Chapters XL, XLIV, and XLV. James Bryce. The Macmillan Company. 1910.
Government and politics in the United States, Chapters VIII and IX. William Backus Guitteau. Houghton Mifflin Company. 1911.
An introduction to political parties and practical politics, Chapters XVIII and XIX. P. Orman Ray. Charles Scribner's Sons. 1917.
Constitution of the State of New York.

PROGRAM 8 (STATE GOVERNMENT)

THE STATE JUDICIARY DEPARTMENT

I. Cases of crime:
1. Procedure:
   a. Arrest by " hue and cry " or by warrant; bail; indictment.
   b. Arraignment and plea.
   c. Trial by petty jury:
      a¹. Selection and pay of jurors.
      b¹. Change of venue.
      c¹. Duties of citizens toward jury service.
      d¹. Perjury.

d. Judge's charge.
e. Verdict of jury.
f. Sentence.
g. Appeal.

2. History and work of the grand jury.
3. District attorney, representative of the State.
4. Summary of rights of accused person.

II. Civil suits at law:
1. Definition.
2. Proceedings of plaintiff and defendant.

III. Courts as interpreters of the law when it is vague or its constitutionality is questioned.

IV. System of New York courts. (*Civics for New York State*, p. 192–199.)
1. Courts of justices of the peace:
a. Four justices of the peace, elected by a town for four years.
b. Place — in towns.
c. Kinds of courts.
a^1. Justice's court for trial of civil suits under two hundred dollars.
b^1. Court of special sessions for trial of petty crimes.
d. Jury of six citizens and freeholders of the town for issues of fact.
e. Pay of justices. Fees fixed by State law.

2. County courts:
a. County judges, elected by voters of the county for a six-year term and paid by the county.
b. Jurisdiction over all crimes except those punishable by death, and all civil suits in which the sum sued for does not exceed two thousand dollars.
c. Jury of twelve men for trial of crime or for issues of fact.

3. The supreme court:
a. Division of State of New York into four judicial departments and each of these into nine judicial districts.
b. One hundred and seven supreme court judges, elected by voters in the nine judicial districts for a term of fourteen years.
c. Jurisdiction over all grave crimes and all important civil suits.
d. Trial and special terms. Supreme court acts as a court of criminal jurisdiction.
e. Appellate division of supreme court.

a¹. One in each of the four judicial departments.
b¹. Term of appellate judges, five years.
c¹. Selection of appellate judges by the Governor from supreme court judges.
d¹. Jurisdiction:
a². Appeals from decisions of county courts.
b². Appeals from trial and special terms of the supreme court.

4. Court of appeals highest of all State courts:
   a. Court of last resort in questions arising under the State law.
   b. Seven justices, one chief, and six associates, elected for fourteen years by voters of entire State. Salary of justices.
5. Other courts:
   a. Coroner's courts.
   b. Surrogate courts.
   c. Court for the trial of impeachments.
   d. Court of claims.
6. General limitations on judges in New York State:
   a. Seventy years age limit.
   b. Acceptance of fees for performance of public duties prohibited except in cases of justices of peace.
   c. Holding of other public office at the same time prohibited.

V. Contrast between active and passive district attorneys as prosecuting officers. Careers of William T. Jerome and Charles S. Whitman of New York. (*The New American Government and Its Work*, p. 336–337.)

VI. Do judicial safeguards protect the criminal too much and society too little? (*The New American Government and Its Work*, p. 337–339.)

REFERENCES

Civics for New York State, Chapters XVI and XVII. Charles DeForest Hoxie. American Book Company. 1916.
The new American government and its work, Chapter XVII. James T. Young. The Macmillan Company. 1917.
The American commonwealth, Vol. I, Chapter XLII. James Bryce. The Macmillan Company. 1910.
Government and politics in the United States, Chapter XI. William Backus Guitteau. Houghton Mifflin Company. 1911.
The labor law and the industrial code. New York State Department of Labor. 1916.
An introduction to political parties and practical politics, Chapter XVII. P. Orman Ray. Charles Scribner's Sons. 1917.

PROGRAM 9 (STATE GOVERNMENT)

PARTY ORGANIZATION, METHODS, AND POWER

"The law of New York provides that every political organization casting a certain number of votes for governor (at present 10,000) shall be known as a political party." (*Civics for New York State*, p. 228.)

I. Parties and platforms:

II. Machinery and methods:

1. Committees:
   a. National committee and auxiliary committees. National chairman, his necessary qualifications and work, and power thru patronage.
   b. State central committee.
   c. Local committees.
2. Election district captains — choice, work, reward.
3. The old convention system contrasted with direct primary elections for nominations.
4. Campaign methods: mass meetings, rallies, stump speeches, campaign clubs, "gum-shoe" campaigns, pamphlets, and newspapers.
5. Party discipline: factions, bolters, splits, rewards.
6. Party finances:
   a. Sources of revenue.
   b. Use and abuse of revenues.
   c. Legislation to regulate; Federal and State laws.

III. Power of parties:

1. Spoils system: history, rotation in office, removal and tenure.
2. Civil service reform: rise of merit system; Pendleton Act of 1883.
3. Bosses and their rule:
   a. Advantages and disadvantages resulting to society from political bosses and machines.
   b. Should legislation ignore, regulate, or abolish them?
   c. Must they be considered a necessary evil of necessary party organization?
4. Law and political parties: extra-legal existence of parties has gradually given way to recognition by enactments to regulate their activities. (*An Introduction to Political Parties and Practical Politics*, p. 11–12.)

REFERENCES

Civics for New York State, p. 226–228. Charles DeForest Hoxie. American Book Company. 1916.

An introduction to political parties and practical politics, Chapters I, IX–XI, XVI. P. Orman Ray. Charles Scribner's Sons. 1917.
Government and politics in the United States, Chapters XXXVI–XXXVII. William Backus Guitteau. Houghton Mifflin Company. 1911.
Autobiography of Andrew Dickson White. The Century Company. 1905.

PROGRAM 10 (STATE GOVERNMENT)
ELECTIONS IN NEW YORK STATE

I. Who may vote? Suffrage qualifications in New York compared with those in other States. (*An Introduction to Political Parties and Practical Politics*, Chapter XII.)
II. Direct primaries for nomination of candidates.
III. Filing of nominations and registering of voters.
IV. Public elections:
  1. Times held.
  2. Officials — poll and ballot clerks, watchers.
  3. Official ballots.
  4. Marking of ballots:
    a. Instruction cards. (*An Introduction to Political Parties and Practical Politics*, p. 324.)
    b. Assistance in case of physical disability.
  5. Counting of ballots.
  6. Provisions against bribery.
  7. Corrupt-practices act.
V. Oath of office.
VI. Public conduct of women as voters at the polls:
  1. Questions that should not be asked:
    a. How shall I vote? This indicates weakness and lack of mental power to decide.
    b. How did you vote? This is an invasion of personal rights. Ballots are meant to be secret.
  2. Impersonal attitude of women on duty at the registration tables or voting booths.
VII. Summary of defects in election system:
  1. Frequency of primaries and elections.
  2. Concurrence of local, State, and national elections.
  3. Excessive number of elective officers.
  4. Common rule of electing candidates by plurality instead of majority vote.
  5. Virtual disfranchisement of absent voters.
VIII. Results of defects in election system:
  1. Blind voting at primaries and at polls.
  2. Little discussion of merits of candidates.

IX. Weakness of the long ballot: "The folly of obliging the people to decide at the polls upon the fitness for office of a great number of persons, lies at the bottom of almost all the misgovernment from which we suffer, not only in cities, but in the States." (*The Misgovernment of New York,—A Remedy Suggested.* Charles Nordhoff. *North American Review*, October, 1871.)

X. Arguments for the short ballot: "Our government would in reality be more democratic if we elected only a few officers and gave them the power to fill by appointment the vast majority of the offices which are now filled by election." "By concentrating public attention upon the merits of the candidates for a few of the most important and policy-determining offices, it is believed that vastly better and more democratic government would result." (*An Introduction to Political Parties and Practical Politics*, p. 343.)

XI. Advantages and disadvantages of suggested reforms: (*An Introduction to Political Parties and Practical Politics*, p. 351–359.)

1. Envelop ballot.
2. Voting machines.
3. Preferential voting.
4. Absent voters laws.

REFERENCES

Civics for New York State. Chapter XX. Charles DeForest Hoxie American Book Company. 1916.
An introduction to political parties and practical politics, Chapters XII–XIII. P. Orman Ray. Charles Scribner's Sons. 1917.
The American commonwealth, Volume II, Chapters LIII and LXXV. James Bryce. The Macmillan Company. 1910.
The eve of election. John B. Howe. The Macmillan Company. 1918.

PROGRAM II (STATE GOVERNMENT)

ASSESSMENT AND COLLECTION OF TAXES IN NEW YORK STATE[1]

"The taxing power is by general consent the most vital and important of all government prerogatives." (*The New American Government and Its Work*, p. 94.)

I. Taxes defined: "Money or service lawfully taken from the people to meet the expenses of their government is called taxes." (*Civics for New York State*, p. 214.)

II. Direct and indirect taxation methods. There used to be sharp distinctions made between direct taxes, such as those levied on personal property, real estate, and incomes, and indirect taxes, such

[1] More details than usual are given in this program because the books necessary to supplement *Civics for New York State* may not be easily obtained.

as those levied on goods imported, liquor distilled in this country, and tobacco. Formerly the States depended mainly on direct taxation to meet their State and local needs, while the United States depended mainly on indirect taxation. In more recent years two distinct tendencies have been evident. First, a very recent tendency on the part of the Federal Government to derive a substantial part of its revenue from a tax on the incomes of both individuals and corporations; second, a tendency in New York State to derive revenue from corporations, inheritance and stock transfers, and to leave the revenue derived from the tax on real and personal property to the counties, cities, and other minor subdivisions of the State. In brief, in recent years the Federal Government has tended to encroach upon the sources of State revenue. and the State of New York has separated the sources of State revenue from the sources of local revenue. This tendency is shown by the receipts for the last three decades as follows:

1888–1897	
From direct taxes..............	$61,285,310.85 (59 per cent)
From indirect taxes............	42,211,904.89 (41 per cent)
1898–1907	
From direct taxes..............	$ 36,755,140.06 (17 per cent)
From indirect taxes............	184,776,169.19 (83 per cent)
1908–1917 [8]	
From direct taxes..............	$ 50,141,719.74 (12 per cent)
From indirect taxes............	369,686,214.63 (88 per cent)

III. Assessment and collection of taxes in New York State:

1. General property tax:

a Officers:

a.[1] In town. Three assessors in each town, elected biennially, two for four years and one for two years; one tax collector in each town elected biennially.

b.[1] In cities of second class (50,000 to 175,000 inhabitants). Four assessors elected for full term of four years, two at each biennial election; a board of estimate and apportionment composed of mayor, comptroller, corporation counsel, president

[8] Only nine months were included in the fiscal year 1916, because of a change in the date of closing the fiscal year.

of the common council, and city engineer, which assists the council in preparing the levy tax.

c.[1] In county. Boards of supervisors, which act as boards of equalization; also commissioners of equalization.

d.[1] In State. The State tax commission composed of three members appointed by the governor to hold office for a term of three years, one member retiring each year; the State board of equalization, composed of the commissioners of the land office and the members of the tax commission; the State comptroller and the State treasurer elected for terms of two years.

b. Assessment:

a.[1] Only one assessment roll for combined State, county, and local purposes is generally used. This is made up by the local assessors on or before August 1, and can be seen and examined by any one until the third Tuesday in August.

b.[1] The law requires that property be assessed at its full value.

c. Review of assessments:

a.[1] Complainants after seeing the assessment roll in August may appear before the assessors who sit as a board of review.

b.[1] The assessors, after taking testimony under oath, may change any assessment that they are satisfied should be changed, and against which formal complaint has been made.

2. Poll taxes in New York:

a. For State purposes; no poll tax.

b. For county purposes; no poll tax.

c. In villages. All men between the ages of 21 and 70 years residing in the village are liable to an annual poll tax of $1, except firemen, honorably discharged soldiers and sailors who have lost one arm or leg in the service of the United States, clergymen and priests, paupers, idiots, and lunatics. A village may decide not to impose a poll tax.

d. In towns. The town superintendent may make an estimate of the number of days' work required for removing snow during the coming year and may assess one day's

labor upon each male of the town above 21 years, with the same general exceptions as in villages; others failing to appear or commute are assessed at the rate of $1.50 a day in the next tax roll.

3. The inheritance tax (transfer tax):
   a. General rules for inheritance taxes in the State of New York are as follows:
      a.[1] They are graded according to the amount of the property involved.
      b.[1] They are graded according to the degree of relationship existing between the testator and the heir; thus, the widow or the children pay a lower tax than cousins or friends.
      c.[1] Property willed to religious, philanthropic, charitable, or educational associations or corporations is exempt.
   b. Counties, cities, and towns do not share in the inheritance tax.
4. Corporation taxes:
   a. State taxes on corporations are as follows:
      a.[1] Organization tax. An organization tax is required of every domestic stock corporation incorporated under any law of this State and a like tax upon any later increase of stock. The tax is payable when incorporation takes place or upon the increase of the stock.
      b.[1] License fee. Every foreign corporation has to pay a license fee for the privilege of exercising its franchise in this State and an extra tax when it uses an increased amount of stock within this State. Certain corporations, such as banking, fire, marine, casualty, and life insurance companies, are exempt.
      c.[1] Franchise tax on income. Both domestic and foreign manufacturing and mercantile corporations have to pay an annual franchise tax of three per cent of the net income of the corporation or portion thereof taxable within the State.
   b. Counties do not share in special corporation taxes.
   c. Cities sometimes oblige public service corporations to pay an annual sum based on gross earnings or income for the use of their franchises and all municipalities levy on special franchises as on other property.

5. Business taxes, licenses, and fees.
   a. State. Liquor taxes, motor vehicles, and vessels inspection and license taxes; peddler and private detective license taxes, and the like.
   b. County. Dog licenses or taxes may be imposed.
   c. Cities, towns, and villages. Cities receive half the liquor licenses. Towns may license peddlers. Villages may license carriages and cabs, auctioneering, circuses, theaters, billiard saloons, bowling alleys, and public halls. New York City thru its board of aldermen may tax a great variety of small individual businesses: for example, auctioneers, public trucks, hacks, express wagons, junk dealers, peddlers using pushcart or horse, public bowling alleys, public billiard tables, fruit or soda-water stands, newspaper and periodical stands, chairs of bootblacks, and stores of secondhand article dealers.
6. School taxes. School taxes are levied on the real estate and the personal property of each school district. The levy is made and the rate fixed by the school trustees, but the taxes are collected in the same way as State, county, and municipal taxes. School districts also receive a portion of the taxes on bank shares collected by the county treasurer, upon an apportionment made by the board of supervisors.

IV. Tax collecting. Tax dodging, tax grievances, and remedies used or proposed. "Every citizen should have an interest in the government and with that interest he should have the sense of responsibility that goes with bearing his share in its cost." (*The New American Government and Its Work*, p. 105.)

REFERENCES

Civics for New York State, Chapter XIX. Charles DeForest Hoxie. American Book Company. 1916.

The new American government and its work, p. 94–108. James T. Young. The Macmillan Company. 1917.

The tax law of the State of New York with 1918 amendments. New York State Tax Bulletin. 1918.

Financial statistics of states [issued yearly]. Bureau of the Census, United States Department of Commerce.

State finances [monthly bulletin]. State Comptroller, Albany, New York.

The following extract is from the July, 1918, issue of this bulletin.

STATEMENT OF GENERAL FUND FINANCIAL OPERATIONS FOR THE FISCAL YEARS ENDED JUNE 30, 1918, AND JUNE 30, 1917

GENERAL FUND	Fiscal year ended June 30, 1918	Fiscal year ended June 30, 1917
REVENUE RECEIPTS		
Direct taxes	$13,203,046 19	$2,745,380 43
Indirect taxes		
Excise (liquor tax)	$11,045,352 65	$12,685,228 22
Corporations	22,078,638 82	13,982,723 87
Organization of corporations	819,365 17	1,217,436 96
Transfers (inheritance tax)	11,433,400 00	13,791,969 65
Stock transfers (stamp tax)	5,312,032 60	7,786,511 88
Secured debt tax	....	766,791 28
Investment tax	1,399,381 21	49,778 60
Mortgages	939,866 11	1,183,409 50
Motor vehicles	2,641,050 20	1,989,847 11
Motor cycles	36,481 45	36,342 31
Other revenues and receipts	6,855,432 52	5,179,819 39
Total indirect taxes and receipts	$62,561,000 73	$58,669,858 77
Total General Fund Revenue Receipts	$75,764,046 92	$61,415,239 20
*EXPENDITURES (classified by general functions of government)		
Executive	$104,933 15	$133,876 39
Administrative	1,865,506 45	1,559,523 32
Legislative	1,721,421 87	2,173,694 78
Judicial	2,841,713 74	3,203,428 54
Regulative	3,991,954 81	3,420,471 18
Educational	10,096,037 91	9,654,665 63
Agricultural	3,114,268 75	2,530,760 91
Defensive	5,103,044 29	2,768,257 49
Penal	2,326,563 49	1,946,721 85
Curative	11,404,009 67	8,071,319 24
Charitable	4,396,119 22	3,773,054 53
Protective	2,780,414 68	1,828,949 74
Constructive	6,912,859 11	6,614,806 84
General	1,023,174 73	930,888 51
	$57,682,021 87	$48,610,418 95
Contributions payable to:		
Canal Fund for appropriations	$3,314,287 43	$1,170,992 98
Total Ordinary Expenditures, etc	$60,996,309 30	$49,781,411 93
State Debt Service		
Saratoga Springs Reservation		
Redemption of debt	$95,000 00	$95,000 00
Interest paid	32,360 00	36,556 00
Contributions payable to:		
Canal Debt Sinking Funds	7,714,337 22	7,097,407 48
Highway Debt Sinking Funds	4,924,842 55	3,168,465 64
Palisades Interstate Park Debt Sinking Funds	276,531 18	150,880 26
State Forest Preserve Debt Sinking Funds	125,388 21	....
Total State Debt Service	$13,168,459 16	$10,548,309 38
Total General Fund Expenditures	$74,164,768 46	$60,329,721 31

* Warrants registered.

STATEMENT OF GENERAL FUND FINANCIAL OPERATIONS FOR THE FISCAL YEAR ENDED JUNE 30, 1918, AND JUNE 30, 1917 (*concluded*)

GENERAL FUND	Fiscal year ended June 30, 1918	Fiscal year ended June 30, 1917
SURPLUS		
Balance beginning of year	$6,825,722 30	$5,411,264 94
Credit: Excess revenue receipts over expenditures	1,599,278 46	1,085,517 89
Transfer from Canal Fund surplus	142,587 02	328,939 47
	$8,567,587 78	$6,825,722 30
Debit: Refund to Common School Fund	1,060 42	....
Balance end of year	$8,566,527 36	$6,825,722 30

PROGRAM 12 (STATE GOVERNMENT)

PUBLIC SCHOOL SYSTEM OF NEW YORK STATE

I. Provisions for education in New York made in New York State Constitution and in city charters. Division of territory, outside of cities and larger villages, into supervisory districts placed under a district superintendent.

II. State commissioner of education, head of New York public education:
1. Elected by the regents.
2. Term, at the pleasure of the regents.
3. Salary, $10,000 a year.
4. Powers and duties.

III. University of the State of New York.

IV. Board of regents; their functions and powers.

V. Board of education and local superintendent of schools in each of the cities and larger villages.

VI. District superintendent in each supervisory district:
1. Chosen for five years by board of school directors, which consists of two directors elected by each town in the district.
2. Both a State and a local officer.
3. Salary of $1200 from the State, in addition to salary voted by the supervisors of towns in his district.
4. Duties: to supervise the free common schools, seeing that proper instruction and discipline are maintained in them; to examine and license teachers.
5. Qualifications: a man or a woman resident of the State who holds a State teacher's certificate and can pass examination in the teaching of agriculture.

VII. School district:

1. Meetings in which the law-making power of the school district is exercised.
2. Executive officers: one or three trustees, a district clerk, a collector, and a treasurer.
3. Powers of citizens in school district meetings and of trustees.
4. Responsibility taken by women in these meetings where they have long been voters.

VIII. Union free school districts:

1. Consolidation of school districts.
2. Board of education, three to nine members.
3. Academic department for high school work.

IX. Schools in cities:

1. Provisions of State constitution and city charters.
2. Board of education and a superintendent of schools for each city.
3. Larger numbers of children and more money to spend per capita for city schools than for district schools.

X. State money for schools.

XI. School-teachers as public officers.

XII. Compulsory school attendance law. What should be the attitude of every parent and citizen towards it?

REFERENCE

Civics for New York State, Chapter XVIII. Charles DeForest Hoxie. American Book Company. 1916.
Constitution of the State of New York, Article IX, sections 1–4.

PROGRAM 13 (FEDERAL GOVERNMENT)

THE FEDERAL CONSTITUTION AND THE NATIONAL GOVERNMENT

I. Events leading up to adoption of the Constitution:

1. Review of formation of the United States out of the original thirteen colonies, the provinces of England.
2. Weakness of the central government under the Articles of Confederation.
3. Fear of a monarchy. Details of forms of government — monarchy, aristocracy, democracy, republic.
4. Constitutional convention and the new constitution for the United States, adopted 1789.

II. The United States and the Constitution; relation to the States and to the people. The people are responsible for the government and obedient to it:

1. A nation, not a confederation — a permanent and indissoluble union. Civil War settled this question.
2. Constitution of the United States, the supreme law. No conflict is permitted between State constitutions and the United States Constitution.
3. Delegation to individual States or the people of all power not specifically granted to the United States in the Constitution of the United States.
4. Concurrent powers and prohibited powers.

III. The Federal Government and its general powers:

1. Control of foreign relations.
2. Control on the high seas and navigable waters.
3. War powers.
4. Power over army and navy.
5. Power to tax and to borrow money.
6. Power to establish post offices and post roads.
7. Power to coin money and to grant patents and copyrights.
8. Control of interstate commerce.
9. Control of territories and public domain.

REFERENCES

Civics for New York State, Chapters xxi–xxii. Charles DeForest Hoxie. American Book Company. 1916.
The American commonwealth, Vol. 1, Chapters ii–iv. James Bryce. The Macmillan Company. 1910.
The new American government and its work, Chapters v–xiii. James T. Young. The Macmillan Company. 1917.
Government and politics in the United States, Chapters xviii–xxi. William Backus Guitteau. Houghton Mifflin Company. 1911.
Constitution of the United States of America.

PROGRAM 14 (FEDERAL GOVERNMENT)

EXECUTIVE DEPARTMENT OF THE UNITED STATES

I. Scope of power of the executive department.

II. President:

1. Qualifications; electoral college and election.
2. Powers and responsibilities: control of United States army and navy as commander in chief, pardon and reprieve, approval or veto of bills, appointment and removal of officers and judges, making of treaties, enforcement of the laws and treaties of the United States.

III. Cabinet:

1. Chosen by the president.
2. Extra-constitutional as the president's advisory council.

3. Provided for by the Constitution as heads of executive departments.

IV. Executive departments and secretaries:

1. Titles and duties of secretaries: Secretary of State, Secretary of the Treasury, Secretary of War, Attorney General, Postmaster General, Secretary of the Navy, Secretary of the Interior, Secretary of Agriculture, Secretary of Commerce, Secretary of Labor.
2. Organization and far-reaching helpfulness of these departments.

V. The vice president and his possible importance.

VI. Presidential succession.

VII. Process of impeachment of a president.

VIII. The president and foreign relations:

1. The diplomatic service and consular representatives.
2. Making of treaties.
3. War power.
4. Recognition of new nations claiming independence.
5. General negotiations and communication with foreign powers.
6. Modern tendency to throw all these powers more and more into the control of the president.

IX. The ideal and the demand of this century for a strong president.

REFERENCES

Civics for New York State, p. 285–292, 300–301. Charles DeForest Hoxie. American Book Company. 1916.

The new American government and its work, Chapter II. James T. Young. The Macmillan Company. 1917.

The American commonwealth, Vol. I, Chapters V–IX. James Bryce. The Macmillan Company. 1910.

Government and politics in the United States, Chapters XXV–XXVII. William Backus Guitteau. Houghton Mifflin Company. 1911.

Constitution of the United States of America.

PROGRAM 15 (FEDERAL GOVERNMENT)

LEGISLATIVE DEPARTMENT OF THE UNITED STATES

I. Work and power of Congress outlined by the Constitution.

II. Sessions of Congress, one long and one short; extra sessions.

III. Salary of congressmen: $7500 a year paid out of the United States Treasury.

IV. Privileges and disabilities of congressmen.

V. The Senate.

1. The branch representing the States as units and corresponding roughly to the House of Lords in England; the upper and the smaller body.

2. Membership: two senators from each State in the Union (ninety-six in 1918), chosen by direct vote of the people of each State. Contrast between this method and the former method of indirect election.
3. One-third of Senate chosen every second year; two-thirds always experienced members.
4. Presiding officer, the Vice President of the United States, who has no vote except in case of a tie vote. Why? The vice president acts with the president in making treaties and appointments.

VI. The House of Representatives:

1. The branch representing the people directly; the lower and the larger body, corresponding to the House of Commons in England.
2. Membership based on the respective population of each State, which is divided into congressional districts; one representative for 211,877 persons.
3. New members chosen every two years; some reelections.
4. Presiding officer, the speaker who is one of the members chosen by the house and who has a vote. Why? Power of the speaker; comparison with that of the prime minister in the English House of Commons.
5. Right to initiate all finance bills.

VII. Composition and work of the committees of Congress.

VIII. Routine of making and passing bills; president's approval or veto.

IX. Control of Federal property thru legislation in Congress: District of Columbia, shipyards, post offices, and customhouses.

X. Federal control of territories (Program 13, p. 23).

XI. Powers forbidden to the United States and granted to the several States.

XII. Powers forbidden to the several States.

XIII. Summary of the important issues in the amendments to the Constitution.

XIV. Organized power of political parties in Congress.

REFERENCES

Civics for New York State, p. 275–285. Charles DeForest Hoxie. American Book Company. 1916.

The new American government and its work, Chapters III, XIII. James T. Young. The Macmillan Company. 1917.

The American commonwealth, Vol. I, Chapters X–XIX. James Bryce. The Macmillan Company. 1910.

Government and politics in the United States, Chapters XXII–XXIV. William Backus Guitteau. Houghton Mifflin Company. 1911.

Constitution of the United States of America.

PROGRAM 16 (FEDERAL GOVERNMENT)

JUDICIAL DEPARTMENT OF THE UNITED STATES

I. The judicial department:
  1. Supreme court provided for by the Constitution.
  2. Inferior courts established by Congress.

II. Jurisdiction of the United States courts.

III. United States Supreme Court:
  1. Present organization, chief duties, and place in public esteem.
  2. History under such judges as Chase, Marshall, and Taney.

IV. Jurisdiction and organization of the United States district courts.

V. Jurisdiction and organization of the United States Circuit Court of Appeals.

VI. Jurisdiction and organization of the Court of Claims.

VII. Jurisdiction and organization of the Court of Customs Appeals.

VIII. Work of United States marshals and district attorneys; federal writs; execution of court judgments.

IX. Overlapping powers of judicial, executive, and legislative departments. Reasons for lack of friction.

X. Proposed changes in the procedure of the Supreme Court and all the Federal courts. Work of William H. Taft on this problem.

REFERENCES

Civics for New York State, p. 293–297. Charles DeForest Hoxie. American Book Company. 1916.

The new American government and its work, Chapter xv. James T. Young. The Macmillan Company. 1917.

The American commonwealth, Vol. 1, Chapters xxii–xxiv. James Bryce. The Macmillan Company. 1910.

Government and politics in the United States, Chapter xxviii. William Backus Guitteau. Houghton Mifflin Company. 1911.

PROGRAM 17 (FEDERAL GOVERNMENT)

FEDERAL PROBLEMS

I. Protection or free trade:
  1. Definition of terms.
  2. Principle of each policy, levying tariff for protection or for revenue only.
  3. Summary of the history of tariffs in the United States from 1783 to 1917. Position of political parties on the question.
  4. Difference made by the Great War in protection and free trade arguments:
    a. Decrease in United States revenue derived from imports.
    b. Indirect protection to trade caused by transportation difficulties.

c. The feeling about the duty of the United States to become self-sufficing by protecting infant or difficult industries.

d. The feeling of opposition to "protection walls" against the Allies.

5. Some future tariff problems for the United States:

a. Will the extreme need of national revenue after this war tend to bring high protective tariffs?

b. Will the infant industries brought into being during this war demand protection?

c. Will free trade advocates be likely to find supporters in Americans who are unwilling to put up tariff walls against the Allies? (*Government and Politics in the United States*, p. 346–347, 380–385, 419; *Introduction to Economics*, Chapters XVIII and XIX; *The Tariff History of the United States*.)

II. Expenditure and revenue. (*The New American Government and Its Work*, Chapter V; *Government and Politics in the United States*, Chapter XXIX.)

III. Coinage and currency. (*The New American Government and Its Work*, Chapter V; *Government and Politics in the United States*, Chapter XXX.)

IV. Commercial functions and regulations. (*The New American Government and Its Work*, Chapters VI–X; *Government and Politics in the United States*, Chapter XXXI.)

V. Immigration and naturalization. (*The New American Government and Its Work*, Chapter XIII; *Labor Problems*, Chapter III; *Government and Politics in the United States*, Chapter XXXV.)

VI. Public domain and territorial functions. (*The New American Government and Its Work*, Chapter XIII; *Government and Politics in the United States*, Chapter XXXIII; *The American Commonwealth*, Vol. II, Chapter XC.)

VII. Merit or spoils system; civil service in its broadest sense.

REFERENCES

The new American government and its work, Chapters V, VI–X, XIII. James T. Young. The Macmillan Company. 1917.

The American commonwealth, Vol. II, Chapter XC. James Bryce. The Macmillan Company. 1910.

Government and politics in the United States, Chapters XXIX–XXXIII, XXXV. William Backus Guitteau. Houghton Mifflin Company. 1911.

Labor problems, Chapter III. Thomas Sewall Adams and Helen L. Sumner. The Macmillan Company. 1917.

Introduction to economics, Chapters XVIII and XIX. Alvin S. Johnson. D. C. Heath and Company. 1909.

The tariff history of the United States. F. W. Taussig. G. P. Putnam's Sons. 1910.

PROGRAM 18

INTERSTATE RELATIONS AND RESPONSIBILITIES

I. Sovereignty of each State in its boundaries, except as restrained by the United States Constitution or by the people of the United States.

II. Credit given by each State to the public acts and records of other States, even when their constitutions and laws vary widely; for example, in divorce, suffrage, compulsory education, factory laws, extradition. (*Constitution of the United States*, Article IV, sections 1 and 2; *Civics for New York State*, p. 271.)

III. Guarantee to each State by the United States Constitution of a republican form of government and protection from invasion. (*Constitution of the United States*, Article IV, section 4; *Civics for New York State*, p. 271.)

IV. Suits in the Federal courts by residents of one State against another State brought only with consent of the first State. (*Constitution of the United States*, Amendment XI; *Civics for New York State*, p. 271.)

V. Reasons for federal legislation for interstate affairs; results and examples of such interstate action:

1. Sherman law (trusts).
2. Mann law (white slavery).
3. Child labor law.
4. Interstate Commerce Commission and laws.
5. Work of Federal Trade Commission.

REFERENCES

Civics for New York State, p. 95–96, 271. Charles DeForest Hoxie. American Book Company. 1916.

The new American government and its work, Chapters VI–IX. James T. Young. The Macmillan Company. 1917.

PROGRAM 19

RELATIONS OF THE UNITED STATES WITH OTHER NATIONS

I. "The United States is a member of the great family of civilized nations, bound by all the common customs and rules regulating the intercourse of such nations," that is, by international law. (*Civics for New York State*, p. 306.)

II. International law is custom, largely unwritten; it depends on the honor of nations to recognize its demands and obligations, since it is a voluntary code.

III. International relations and foreign ministers:

1. Ambassadors and ministers:
   a. Representatives of their governments before the governments to which they are sent. The United States has no professional diplomatic corps corresponding to that of other countries.
   b. Aid in the negotiation of treaties and other international intercourse.
   c. Ranks: ambassadors, extraordinary and plenipotentiary; envoys extraordinary and ministers plenipotentiary; secretaries and attachés at embassies and legations.
   d. Rights and privileges.
2. Consuls:
   a. Business agents who look after the commercial interests of the citizens of their country in other lands.
   b. Residence in chief cities of foreign countries; subject to laws of the land in which they reside.
   c. Duties.
3. Treaties:
   a. Purpose of treaties.
   b. Powers of the president of the United States and of the Senate in making treaties with foreign countries.
   c. Violations of treaties. If remonstrance is ineffective, war is generally the result. (*My Four Years in Germany.*)
4. Rights of travelers and treatment of criminals.

IV. International relations in time of war:

1. Declaration of war after *casus belli* is known and stated.
2. Rights and duties of neutrals and noncombatants in war.
3. Property rights during war; contraband; privateering.

V. Arbitration among international powers:

1. The Hague Conference and Treaty of 1899. Nations that signed it. (*Civics for New York State*, p. 314–315.)
2. Permanent court of arbitration of The Hague.
3. Governments on an equality under international law.
4. Actions of Germany since 1914 in the light of international law.

REFERENCES

Civics for New York State, Chapter XXIV. Charles DeForest Hoxie. American Book Company. 1916.

The new American government and its work, p. 21–30. James T. Young. The Macmillan Company. 1917.

The American commonwealth, Vol. II, Chapter CXVI. James Bryce. The Macmillan Company. 1910.

Government and politics in the United States, Chapter XXXII. William Backus Guitteau. Houghton Mifflin Company. 1911.
My four years in Germany. James W. Gerard. George H. Doran Company. 1917.
Autobiography of Andrew Dickson White. The Century Company. 1905.

PART II. SOCIAL AND INDUSTRIAL PHASES

The outline for the study of social and industrial conditions and problems cannot be based on any one book. Probably the individual club members will have to depend largely on the leader's presentation of the subject matter in each of these four programs. The leader should have access to at least one good book for each program, such as *Labor Problems*, by Adams and Sumner, for programs 21 and 22. Good references may be selected from the lists given on pages 39 and 40. Each of these books in turn will furnish valuable lists of other books on the respective topics. This material may be supplemented by newspapers, periodicals, and books from the nearest public library.

These programs are meant to awake rather than to satisfy a desire to understand some of the social and industrial problems of to-day and the efforts at solving them. Altho the woman as a voter may never vote directly as a member of the legislative departments of city, state, or nation, on the questions involved, she will have a share in legislation affecting and shaping the solution of such problems. She must know enough meanwhile to follow the attitude and promises of men on such questions before she gives them her support as a voter.

PROGRAM 20
LABOR AND CAPITAL

"Labor must get a living wage; capital must get profits."

I. Scope and object of labor and capital in their relations.
II. The old policy of *laissez faire*, or let it alone.
III. The newer policy of government regulation.
IV. Possibilities of labor combinations on the one hand and associations of capital on the other.
V. Governmental regulation of labor and capital thru the "police power" of the State:
 1. State and Federal legislation, inspection, and prosecution of offenders.
 2. Control of hours, Sunday labor, night shifts, apprenticeship, safeguarding of machinery, ventilation, fire escapes, wages, and vocational education:
  a. Should government or trade unions control each of these items of dispute?

b. Fitness and weakness of each factor for such decisions and administration.

VI. Should the state force settlement of quarrels between labor and capital; between union and non-union men; between men and women as competing laborers; between exploiting employers and defenseless employees?

VII. Object and work of the United States Department of Labor.

VIII. War conditions as a force in making the Federal Government, thru the President and the Department of Labor, interfere in labor disputes:

1. President Wilson at the Buffalo meeting of the American Federation of Labor in June, 1917.
2. Representatives of labor and capital called to Washington to confer on strikes during the war, by Secretary Wilson, of the Department of Labor, in February, 1918.
3. War Labor Board.

IX. Profit sharing and cooperative production and distribution as remedies for labor troubles and disputes with capital.

X. Industrial or vocational education as a remedy:

1. Should the Federal, the State, or the municipal government provide for it?
2. Should capital assume the burden?
3. Should labor under trades unions provide and dictate it?

XI. Should the Government take over production and distribution, and control of consumption?

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PROGRAM 21

GOVERNMENT AND POVERTY

"Poverty breeds poverty; it is cumulative, not self-eliminating." (*Labor Problems*, p. 490.)

I. Relation of nonemployment to poverty.
II. Relation of inefficiency to nonemployment.
III. Relation of lack of training to nonemployment.
IV. Responsibility of society for preventing poverty:
  1. Should the government, public or private philanthropic organizations, or the persons involved assume responsibility for preventing poverty?
  2. Should society thru individuals as consumers pay to prevent poverty or as taxpayers suffer the effects by maintaining almshouses and jails?
  3. Should employers pay wages sufficient to prevent poverty?
V. Attitude of European countries on problems of poverty and nonemployment.
VI. Remedies proposed:
  1. Insurance — compulsory accident, sickness, and old age.
  2. Employers' liability.
  3. Minimum wage.

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PROGRAM 22

GOVERNMENT CONTROL OF SOCIAL AND MORAL CONDITIONS

I. Wisdom of division of control among Federal, State, and municipal governments:
  1. Federal control:
    a. White slavery.
    b. Alien immigrants' physical and mental condition.
    c. Child welfare.

2. State control:
   a. Education for minors and adults.
   b. Vocational education.
   c. Factory laws, hours of labor, and the like.
   d. Park systems and public bathhouses when several towns are involved.
   e. Divorce and eugenic marriages.
3. Municipal control:
   a. City parks and playgrounds.
   b. Dispensaries and hospitals.
   c. Sewerage and clean streets.
   d. Pure water supply and safe drinking fountains.
   e. Sites of buildings, fire protection, and tenement conditions.
   f. Guarded lavatories to prevent spread of venereal diseases.
   g. Dance halls, questionable theaters and shows.
   h. Sufficient lighting of streets and doorways.

II. Constructive control:
1. Child welfare work and propaganda.
2. Social centers for safe amusement and recreation for youth and adults.
3. Juvenile courts, probation officers, police matrons, hospitals for infectious diseases, schools for subnormal children.
4. Children's museums, municipal music, libraries.
5. Good modern tenements.
6. Wise city planning in zones, for both present and future.

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PART III. INTERNATIONAL PHASE

Much of the energy, wealth, sympathy, and vision needed both during the war and after a peace settlement, must come from women. It is to be hoped that the women of New York State, as voting citizens, will be able to give intelligent aid to the legislature and to the administrative

committees and commissions that have to deal with all such political, social, and industrial problems. They must study these questions widely and constantly in order to be able to aid in choosing candidates for public office who have the right attitude and capacities, and they must be able to follow up the results of the policies of political leaders. Only after following carefully the effect of the Great War on civil life can they meet civic problems with any degree of adequacy.

The history of the Great War is yet to be written. Meanwhile the reader is likely to become bewildered with the mass of literature and official records on the subject, unless he concentrates in a brief but logical way on the main outline of such a history. A good outline of this sort, based on a mass of material in various languages and forms that is inaccessible to the general reader, is called *The Study of the Great War: a Topical Outline*, and is published by the McKinley Publishing Company, Philadelphia. It is the work of students of history who have been in close touch with the Committee on Public Information, Washington, D. C. Publications of this committee in the form of paper-covered pamphlets, sold at a nominal price and quoted by exact reference thruout the outlined topics, make the best, as well as the cheapest, collection of material for such study as the club members can undertake. It is urged that each member buy this topical outline and at least four of these war information pamphlets of the Red, White, and Blue Series, probably *The Battle Line of Democracy, Conquest and Kultur, German War Practices, War Cyclopedia.*

As the war progresses, additional topical outlines and pamphlets will appear, and it is hoped that each student voter this year will buy for use by her family in the future, as well as by herself at present, copies of this story of the Great War. So many interesting books on certain details or phases of the war have been written that some will be found in even small town libraries or in private homes.

In the readjustments of life here at home with the return of crippled soldiers and of those who wish to resume their former places in industrial plants, transportation, and agricultural service, thinking women can be of inestimable service. Thousands of women who have had to become breadwinners during the war or who, as wives and mothers of crippled soldiers must keep on earning a livelihood outside the home, will probably be thrown out of employment at least temporarily. Already American women who are free to help carry burdens "over there" have taken their part in the labors of European reconstruction thru participation in Red Cross and civilian relief work. That experience will be of immense value to them in later reconstruction work abroad and in the rehabilitation of families at home.

PROGRAM 23

EUROPEAN POLITICAL CONDITIONS AND IDEALS IN 1914

I. Peace of Europe in 1914. "In 1914, however, Europe appeared to be in perfect peace on the morning of July 23; but on the evening of August 2 six powers were already committed to war." (*The War in Europe*, p. 6.)

II. Position of the United States in 1914.

The United States up to July, 1914, in common with most of the countries of Europe, was looking forward not only to peace but to disarmament. No country, so far as the United States knew, was contemplating a change in either her boundaries or her government.

III. Movement for international peace before 1914.

Robinson and Beard in a closing chapter in *Outlines of European History*, brought up to date in 1912, said "...... the movement for the international peace has been growing apace...... It may be truly said that the idea of the world pacification has passed from the stage of theory into the field of practical politics...... No temporary setback, however, can check the movement against war. As Mr. Roosevelt said at Christiania in an address acknowledging the Nobel peace prize of 1910: 'Something should be done as soon as possible to check the growth of armaments, especially naval armaments, by international agreement......Granted sincerity of purpose, the great powers of the world should find no insurmountable difficulty in reaching an agreement which would put an end to the present costly and growing extravagance of expenditure on naval armaments...... Finally, it would be a master stroke if those great powers honestly bent on peace would form a league of peace, not only to keep peace among themselves, but to prevent by force, if necessary, its being broken by others. The ruler or statesman who should bring about such a combination would have earned his place in history for all time and his title to the gratitude of mankind.'"

Another historian, Hazen, sensed the mind of the American people when he devoted several pages of his *Europe since 1815* to a discussion of the Hague conferences and disarmament. "Whether the Hague Conferences will be reckoned in history as simply inconsequential outbursts of sentiment, as merely the baseless fabric of a vision, or whether they will be looked upon as the small beginnings of great institutions, remains to be seen."

IV. European and Asiatic countries and their government in 1914:

COUNTRY	FORM OF GOVERNMENT
Austria-Hungary	A dual constitutional monarchy, dominated by aristocratic class
Belgium	Democratic monarchy
China	Newly made republic[4] with feudalistic local government
Denmark	Constitutional monarchy under democratic control
Great Britain	Democratic monarchy
France	Republic
Germany	Nominally a constitutional monarchy, but under domination of Prussian feudalism
Italy	Constitutional monarchy
Japan	Constitutional monarchy, but feudalistic influence still strong
Norway	Monarchy under democratic control
Persia	A feudalistic state with a promulgated constitution
Russia	Absolute monarchy, in spite of the Duma
Spain	Constitutional monarchy
Sweden	Monarchy under democratic control
Switzerland	Republic
Turkey (European and Asiatic)	Absolute monarchy altho the "Young Turk" promulgated a constitution in July, 1908

V. Alliances in Europe:

1. Germany, Austria, and Italy formed the Triple Alliance in 1882.
2. France, Russia, and England perfected the Triple Entente — good understanding — in 1907.

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[4] The oriental countries of Asia are very different from the western countries in Europe and America in a political sense. There they have personal politics. A feudalistic class, which owes its position entirely to birth, may control affairs even in a so-called republic.

PROGRAM 24

BEGINNING OF THE GREAT WAR

I. Underlying causes of the Great War:
  1. Aims of the Germans in their own words:
    a. To hold " a place in the sun."
    b. To spread German kultur over all other races and countries.
    c. To take the trade of Great Britain.
    d. To take " Mittel Europa."
  2. German militarism and armaments.
  3. Failure of the Hague Peace Conferences of 1899 and 1907, and of the Naval Conference of London, 1908–1909.
    a. Refusal of Germany to enter into an arbitration treaty with the United States.
    b. British and German views of the " freedom of the seas."
  4. Colonial rivalry among the Great European powers over Africa, Asia Minor, Mesopotamia, Persia, and South America.
  5. Desire of France to recover Alsace-Lorraine.
  6. Desire of Italy to reclaim lands held by Austria.
  7. The Austro-Serbian controversy and war.

II. Occasion: German ultimatums and declarations of war against Russia and France.

III. Relative strength of combatants.

IV. Violation of the neutrality of Belgium by Germany and the entrance of Great Britain into the war, on August 3, 1914.

V. Allies and neutrals. Italy, in May, 1915, and the United States, on April 6, 1917, join Russia, France, and Great Britain as Allies; other lesser states as allies or neutrals.

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PROGRAM 25

CHALLENGES OF TO-DAY TO NEW YORK WOMEN AS VOTERS

I. Threatening of the security of the best interests of homes and nations.

II. Work of the women of Belgium to keep their nation and race alive.

III. Work of the English and French women in trades, industries, and professions, to release men for war service.

IV. Work of individual women who have been caught in their homes in the war zone.

V. Dangers of nervous and physical overstrain, which confront women in industry and on farms. Study of ways of prevention.

VI. Problems of housing, feeding, and recreation, presented by cantonments and by munition plants in civilian life.

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My home in the field of honour. Frances Wilson Huard. George H. Doran Company. 1916.
When the Prussians came to Poland. Laura de Gozdawa Turczynowicz. G. P. Putnam's Sons. 1916.
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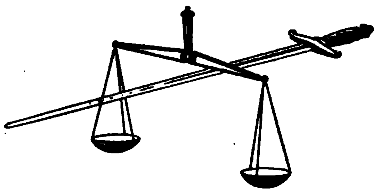
August 20, 1919.



1744

THE CORNELL READING COURSE FOR THE FARM HOME

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NOVEMBER, 1918 FOOD SERIES LESSON 121

SUGAR-SAVING DESSERTS AND CONFECTIONS

THE American people were pledged to ship to their armies, the allied civilians and armies, the Belgian relief, and certain neutrals, 330,000 more tons of sugar this year than last year. The amount that was to have been sent this year was three times as great as the average for a period of three years just preceding the war.

The change in this program, which will be necessitated by added millions of people to be fed during the period of reconstruction, has not yet been announced. However the use of a very moderate allowance in this country will be in the interest of the hungry, war-worn soldiers and civilians across the sea. Until shipping is readjusted and the factories and fields of Europe are again producing, scarcity of sugar may be expected.

Honey, maple sirup or sugar, molasses, and various commercial sirups can well be used in the place of cane or beet sugar. All these substitutes for cane or beet sugar are good for certain uses. Skillful combination of two or more of them will often produce the desired sweetness without the flavor of any one of them being too pronounced. For example, when honey is combined with corn sirup, the mixture is sweeter than corn sirup alone and the pronounced flavor of the honey is modified.

During the sugar shortage, confections made of sweets other than cane or beet sugar should be used, and they should take the place of a sweet dessert instead of being eaten in addition to other sweet foods.

CONSERVATION RECIPES

In the following recipes the proportions given for the most common sweeteners may serve as a guide for using others that are locally abundant.

For each cup of honey, molasses, or sirup used to substitute sugar in a recipe calling for it, the amount of other liquid called for should be reduced ¼ cup.

In making batters or doughs with either honey or molasses, soda should be used to neutralize the acid. Altho the acidity varies, the amount of soda to be used is generally between ¼ and ½ teaspoon for 1 cup of honey or molasses; the amount necessary for molasses generally approaches ½ teaspoon.

In the following recipes measurements for wheat substitutes are given in order that supplies on hand may be used and waste prevented.

CHOCOLATE CORNSTARCH PUDDING

3 cups milk
¾ square chocolate
¼ cup honey and ¼ cup sugar,
  or ⅓ cup corn sirup and ⅓ cup sugar,
  or ½ cup honey or maple sirup,
  or 1 cup corn sirup,
  or ¾ cup corn sugar
7 tablespoons cornstarch
¼ teaspoon salt
Vanilla, if desired

Scald the milk in a double boiler. Add the chocolate, and stir the mixture until the chocolate is melted. Mix the sweetening, the cornstarch, and the salt, and add this mixture to the hot milk and chocolate. Stir this mixture until it thickens, and cook it over hot water for 20 minutes. Add the vanilla, and pour the pudding into molds that have been rinsed in cold water. Chill the pudding, and serve it with cream.

This pudding may be used for a pie filling. Pour the warm mixture into a baked crust, cover it with meringue if desired, and brown it in a slow oven.

MERINGUE

Whites of 2 eggs
⅛ teaspoon cream of tartar
1½ tablespoons honey,
  or 2 tablespoons corn sirup
Few drops vanilla

Beat the whites of the eggs, and the cream of tartar. Pour the honey over the beaten egg whites gradually, and beat the mixture until the honey is thoroly mixed in. If corn sirup is used, heat it until it just begins to thread before pouring it over the eggs. Add the vanilla. Heap the meringue lightly on a pudding or a pie, and brown it delicately in a slow oven. Care must be taken not to cook the sirup too much, because this will cause the meringue to be gummy.

CUSTARD

4 eggs
1 quart milk
½ teaspoon salt

3 tablespoons honey and 2 tablespoons sugar,
or 4 tablespoons corn sirup and 4 tablespoons sugar,
or ⅓ cup honey,
or ⅔ cup corn sirup
Nutmeg or vanilla

Beat the eggs slightly and add the other ingredients. For soft custard, cook the mixture over hot water until it is thickened, stirring it constantly. For baked custard, turn the mixture into custard cups set in a pan of hot water, and bake it in a moderate oven until it is firm. If dark-colored sirup is used, the custard resembles that made with caramel.

FROZEN CUSTARD

Follow the recipe for custard, using ½ cup of honey and ½ cup of sugar, or 1 cup of honey, or 2 cups of corn sirup. Cook the mixture according to the directions given, cool it, and freeze it in the same way as any ice cream.

FRUIT ICES

Honey or sirup may be used in combination with sugar or alone for sweetening fruit ices. The amount can be determined by taste.

STEAMED BROWN PUDDING

1 egg
¾ cup molasses
¾ teaspoon soda
⅔ cup warm water

1 cup barley flour and ½ cup corn flour or wheat flour,
or 1½ cups wheat flour
¼ teaspoon salt

Beat the egg until it is light. Add the molasses and the warm water. Sift the dry ingredients, and add them to the liquid mixture. Fill greased molds two-thirds full with the batter, and steam it for 2 hours, or cook it in hot water for 2½ hours in a fireless cooker. This amount will fill three one-half-pound baking powder cans.

PUDDING SAUCE

1 egg
¼ cup honey and ¼ cup sugar,
or ⅓ cup corn sirup and ⅓ cup sugar,
or ½ cup honey,
or ¾ cup corn sirup or corn sugar

¼ cup hot water
1½ tablespoons butter
½ lemon, juice and grated rind

Beat the egg, add the other ingredients in the order given, and cook the mixture over hot water for about 15 minutes, or until it has thickened,

stirring it constantly. If honey is used, its flavor is pronounced. This recipe makes about 1¼ cups of sauce.

CHOCOLATE CAKE

¼ cup fat
1 egg
⅜ cup honey and ⅜ cup sugar,
  or ½ cup corn sirup and ½ cup sugar,
  or ¾ cup honey and ⅛ teaspoon soda,
  or 1 cup corn sirup

¼ cup milk if honey or sirup is used,
  or ⅓ cup milk if sugar is used
1 cup barley flour and ¾ cup corn flour,
  or 1¼ cups wheat flour and ⅓ cup corn flour,
  or 1½ cups wheat flour
2½ teaspoons baking powder
1 teaspoon vanilla
1 square chocolate

Cream the fat, add the beaten egg, the sweetening, and the milk. Sift the dry ingredients and add them to the mixture. Then add the vanilla and the melted chocolate. Bake the cake in a moderate oven for 55 to 60 minutes. If honey alone is used, the cake has a distinct honey flavor.

YELLOW CAKE

5 tablespoons fat
½ cup sirup
½ cup sugar
1 egg
¾ cup sour milk

2¼ cups wheat flour
1½ teaspoons baking powder
¾ teaspoon soda
1 teaspoon vanilla

Cream the fat, and add the sirup and the sugar. Then add the beaten egg, the milk, the sifted dry ingredients, and the vanilla. Bake the cake in a loaf or in two layers that may be put together with a fruit filling.

MOLASSES CAKE

¼ cup fat
1 egg
¾ cup molasses
½ cup warm water
1 teaspoon soda

1½ cups barley flour and ½ cup rice or corn flour,
  or 1¾ cups wheat flour
¼ teaspoon ginger
½ teaspoon cinnamon

Cream the fat. Add the beaten egg, the molasses, and the warm water. Sift the dry ingredients, and add them to this mixture. Bake the cake in a moderate oven for about 45 minutes.

DROP COOKIES

¼ cup fat
1 egg
¼ cup honey and ¼ cup sugar,
  or ⅓ cup corn sirup and ⅓ cup sugar,
  or ¾ cup honey,
  or ¾ cup corn sirup
¼ cup sour milk
⅛ teaspoon soda,
  or ¼ teaspoon if honey only is used

2 teaspoons baking powder
1 cup corn flour and 1 cup barley flour and 3 tablespoons cornstarch,
  or 1⅔ cups wheat flour and ½ cup corn flour,
  or 2¼, scant, cups wheat flour
¼ teaspoon salt
1 teaspoon vanilla

Cream the fat. Add the beaten egg, the sweetening, and the sour milk. Sift the dry ingredients, and add them to this mixture. Then add the vanilla. Drop the batter by spoonfuls on a greased tin, and bake the cookies in a moderate oven for 15 or 20 minutes. This recipe makes about forty cookies two inches in diameter.

SWEETENING FOR BEVERAGES

Honey or sirup can be used successfully for sweetening lemonade, iced tea, grape juice, and other beverages. If these sweeteners are first added to a small amount of cold juice or a small amount of cold water and stirred well, they are not so difficult to mix with the beverages as when they are added to the entire amount of liquid. In the case of iced tea, the sweetening may be mixed with the hot tea before it is poured over the ice.

COCOA

3 tablespoons cocoa
1 tablespoon honey and 1 tablespoon sugar,
  or 2 tablespoons corn sirup and 1 tablespoon sugar,
  or 2 tablespoons honey,
  or 4 tablespoons corn sirup

¾ cup water
1 quart milk
1¼ teaspoons salt

Mix the cocoa, the sweetening, the water, and the salt in a saucepan, and cook the mixture for 5 minutes or more, stirring it constantly, until the starchy taste disappears. Add the milk slowly, and let the mixture come to the boiling point. Remove it from the heat, and beat it with a dover egg-beater until the top of the cocoa is covered with foam.

MARSHMALLOWS

1 tablespoon granulated gelatin
5 tablespoons cold water
1½ cups sirup
⅓ cup water
1 egg white
Salt
1 teaspoon vanilla

Soak the gelatin in 5 tablespoons of cold water. Add ⅓ cup of water to the sirup, and cook the mixture to the hard ball stage (115° C., or 239° F.). Pour this over the gelatin, beating the mixture constantly. Add the egg white, which has been beaten stiff; then add the salt and the vanilla. Beat the mixture until it is very stiff, and pour it on a dish dusted with cornstarch. The next day cut it into squares, and roll the marshmallows in cornstarch and a small amount of powdered sugar.

LUCILE BREWER

CHOCOLATE CARAMELS

1 cup sirup
1 square chocolate
3 tablespoons sour cream
1 teaspoon vanilla

Cook the sirup, the chocolate, and the sour cream to the hard ball stage (118° C., or 244° F.). Add the vanilla and pour the mixture into greased tins. When cool, mark it in squares.

LUCILE BREWER

BUTTERSCOTCH

1 cup sirup
1 teaspoon lemon extract
1/16 teaspoon salt
1 teaspoon vinegar
2 tablespoons butter

Cook the sirup slowly until it is nearly to the caramel stage (300° F., or 149° C.). Add the remaining ingredients just before removing the sirup from the fire. Pour it into a greased tin and mark it into squares, or drop it on waxed paper.

LUCILE BREWER

SOFT TAFFY

¾ cup sirup
¾ cup molasses
1½ tablespoons vinegar
1½ tablespoons butter
Vanilla

Cook the candy to the crack stage without stirring it, and turn it onto a greased plate. When it is cool enough to be handled, pull it, working in the vanilla while pulling it. With scissors cut the taffy into desired lengths, and roll the pieces in oiled paper.

LUCILE BREWER

PEANUT BRITTLE

1 cup sirup
1 tablespoon vinegar
½ teaspoon salt
1 teaspoon vanilla
1 cup freshly roasted peanuts, halved

Cook the sirup, the vinegar, and the salt in a saucepan until a little dropped in cold water forms a soft ball. Put the peanuts and this sirup into an iron skillet, and heat the mixture, stirring it, until it becomes a golden brown. Remove it from the fire, and stir in the vanilla. Pour the candy into a shallow buttered pan, and spread it out in a thin sheet. After it has cooled, remove it from the pan and crack it into pieces.

UNITED STATES FOOD ADMINISTRATION

FRUIT PASTE

½ cup chopped dried apricots
½ cup chopped dried figs
1 cup raisins
1 cup sirup
½ lemon, juice and grated rind

Simmer all the ingredients together until the paste is clear and thick. Turn the mixture onto greased plates, and allow it to stand until it is cold. Cut it into cubes or strips, and roll them in sugar or wrap them in oiled paper.

LUCILE BREWER

STUFFED PRUNES

Steam 1 pound of prunes, and remove the stones. Stuff the prunes with other prunes, with salted nuts, or with a mixture of equal parts of chopped raisins, walnuts, and candied cherries.

UNITED STATES FOOD ADMINISTRATION

APPLE PASTE

Prepare apple pulp by cooking the apples and putting them thru a sieve. Cook the pulp until it is very thick, stirring it to prevent sticking. Measure the pulp, and add 2 tablespoons of sirup to each cup of apple pulp. Cook the mixture until it is clear. Grease a plate slightly with a little oil or unsalted fat. Turn the paste onto the plate, and place it in a slow oven or an airy place to dry. When a film has formed over the top, turn the paste onto cheesecloth and dry it. When it is sufficiently dry, lay it on a piece of oiled paper and roll it in a small roll. Turn the ends of the roll under, and store the paste in a cool dry place.

This paste will keep indefinitely. It may be used as a confection by cutting it in small pieces and rolling them in sugar, if desired. It is also excellent for garnishing desserts and is good in cakes when cut in small pieces. It may be soaked and heated for sauce.

LUCILE BREWER

DRIED APPLE SAUCE

Bright colored apples, such as Baldwins, are to be preferred for dried sauce. Wash them and cut them in dice. Do not pare them. Cook them in a small amount of water until they are tender. Add 2 tablespoons of sirup for each cup of sauce, and cook the mixture until it is clear. If desired, a small amount of grated lemon peel may be added or a small stick of cinnamon. Dry the sauce according to directions for paste. This sauce is less trouble to make than paste and is excellent; it may be used in the same ways.

LUCILE BREWER

APPLE RINGS

Red apples are the best for making rings. Baldwins are excellent. The apples should be firm and free from blemishes. Remove the cores with an apple corer; do not pare the apples. Cut them in slices about ¼ inch thick. If desired, cut the apples in eighths. To 1 cup of sirup add ½ cup of water. Allow the mixture to come to the boiling point, add the rings, and cook them rather slowly until they are tender. Lift them on to a plate to drain. Lay them on cheesecloth on a screen to dry. Do not cook too many rings at one time; they must not be crowded.

When the rings are dry, they should be deep red in color and should have a glazed surface. When they are glazed and no longer sticky, wrap them in oiled paper, and store them in a cool dry place. They will keep indefinitely, and are excellent as garnishes for various desserts, such as gelatins, cornstarch puddings, and frozen desserts.

CANDIED CARROTS

Cook medium-sized carrots until they are tender. Plunge them into cold water, and slip off the skins. With an apple corer remove the centers. Cut the carrots in rings ¼ inch thick. To 1 cup of corn sirup, add ½ cup of water. When it is boiling, add the carrot rings and 1 slice of lemon. Simmer them until they are clear. Drain them on a plate and place them on cheesecloth on a screen to dry. When they are glazed and no longer sticky, place them between oiled paper, and store them in a cool dark place.

Candied plums, cherries, and other fruit may be made by cooking them in the sirup and drying them in the same way.

THE CORNELL READING COURSE FOR THE FARM HOME

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NOVEMBER, 1918 FOOD SERIES LESSON 122

HOW TO USE THE APPLE CROP

LUCILE BREWER

THE CORNELL READING COURSE FOR THE FARM HOME

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HOW TO USE THE APPLE CROP

LUCILE BREWER

The large apple crop in New York State this season should aid materially in the effort that is being made to carry out the food conservation program. All fresh fruits and vegetables that are plentiful should be eaten in season and preserved for future use in order that the staple foods needed may be accumulated for shipping overseas.

Apples are palatable, nutritious, healthful, and inexpensive. They can be used probably in a greater variety of ways than any other fruit. They may be served for breakfast, dinner, and supper; nor is an apple between meals open to the objections against eating cookies and cakes at such times.

New York State apples are in season a large part of the year, as can be seen from the following list. A variety that is in prime condition at the time when it is to be used and that is adapted to the purpose for which it is to be used, should be selected. The buyer should ask for home-grown apples in season; they will be crisp, juicy, and delicious. New York State apples cannot be excelled for eating out of hand, or for apple sauce, baked apples, pies, apple cakes, dumplings, puddings, or for preserving by canning or drying.

VARIETIES OF APPLES

A brief description of the most common varieties of New York State apples with the months in which they are in season and the uses to which they are adapted, is given in the following list by R. W. Rees. By *dessert* apple is meant one suitable for eating uncooked; this is an old usage of the word *dessert*, which has been accepted by pomologists for many years. The degree of tartness is indicated by the pomological terms *acid* and *subacid*.

Yellow Transparent. Medium size; yellow. Acid. July and August. Sauce; pie; dessert (very good when well matured).

Red Astrachan. Medium to large; red or striped. Acid. August and September. Dessert; pie; sauce.

Primate. Medium size; whitish yellow. Acid. August and September. Dessert; general cooking (fair).

Sweet Bough. Medium to large; greenish yellow. Sweet. August and early September. Dessert; baking.

Oldenburg (Duchess). Medium to large; striped. Acid. August and September. Sauce and pie (excellent); dessert (fair when well matured).

Chenango. Medium size; yellowish with pink and red stripes. Subacid. August and September. Dessert (very good).

Gravenstein. Medium to large; yellow, red striped. Subacid. September to November. Cooking; dessert (very good).

Alexander and Wolf River. Large to very large; red or red striped. Acid. September to November. Baking (very satisfactory for restaurants).

Twenty Ounce. Very large; greenish yellow, red striped. Acid. September to December. Sauce, pie, and dumplings (good); baking, jelly, and marmalade (very good).

Maiden Blush. Medium size; yellow with blush cheek. Subacid. September to November. Pie (excellent); dumplings; sauce (good); jelly (fair).

Wealthy. Medium to large; red or red striped. Subacid. October to December. Dessert (good); sauce or baking (excellent).

McIntosh. Medium to large; red, very white flesh. Subacid. October to December. Dessert, salad, baking (very good); sauce or pie (good).

Fall Pippin. Large to very large; greenish yellow. Acid. October to January. Dessert (good); sauce and general cooking (very good).

Tompkins King. Large to very large; yellow, red striped. Mild subacid. October to January. Sauce and baking (excellent); dumplings, jelly, and marmalade (very good); dessert (good); pie (fair).

Hubbardston. Medium to large; greenish yellow, red striped. Mild subacid. October to January. Dessert and general cooking (good when well matured, but still very firm).

Fameuse, or Snow. Small to medium; red or red striped. Subacid. October to December. Dessert, jelly, and marmalade (very good); dumplings (excellent); sauce and pie (good).

Wagener. Medium to large; red or red striped. Acid. October to February. Dessert and general cooking (good).

Rhode Island Greening. Large; green, sometimes yellowish. Acid. October to March. Dessert (good);, general cooking (very good). The leading variety in New York for cooking.

Esopus (Spitzenburg). Medium to large; red. Acid. November to February. Dessert (excellent); sauce and general cooking (good).

Tolman Sweet. Medium size; yellow. Sweet. November to January. Dessert; baking and preserves (excellent).

Baldwin. Medium to large; red. Subacid. November to March. General cooking and dessert (good); pie (very good). The leading commercial variety in New York.

Rome. Medium to large; greenish yellow, red striped. Subacid. November to March. Baking, jelly, and marmalade (excellent).

Northern Spy. Large; yellowish, red striped. Subacid. December to February. Dessert, sauce, and dumplings (very good); pie and baking (excellent). One of the best varieties grown in New York.

Roxbury Russet. Medium to large; yellowish russet. Subacid. December to May. Dessert; cooking.

Ben Davis. Medium to large; yellowish, red striped. Subacid. January to June. Cooking (fair, late in season).

Yellow Newtown. Medium to large; greenish yellow. Subacid. February to May. Dessert (very good).

CONSERVATION RECIPES FOR USING APPLES

Apples, because of their mild flavor, are excellent extenders of other fruits that may be more expensive or less abundant. They may be combined with other fruits for butter, jam, marmalade, jelly, and sauce. A good jelly can often be made of fruits containing little pectin or of rhubarb, if apples are added. If the variety of apples used is somewhat tasteless, another fruit may be combined with them for flavor.

Sweet apples are good for baking and for preserves. They are often combined with quinces.

In the following recipes, sugar is saved by using various kinds of available sirups or honey for part of the sweetening. The amount of sirup or honey used may vary. In some cases no added sweetening is required; the fruit product is concentrated until the natural sweetness of the fruit is sufficient.

In making jams, conserves, or preserves, the cooking should begin rather rapidly, and toward the end the heat should be decreased in order that the mixture may then cook slowly.

CANNED APPLES

2 cups apples, cut in eighths	¼ cup sugar
½ cup sirup	2 cups water

Boil the sirup, the sugar, and the water for 5 minutes, add the apples, and cook them until they are clear. Pour them into sterilized jars and seal them. This makes a thin sauce.

CANNED BAKED APPLES

Wash and core good, sound, tart baking apples. Fill the cavities with sirup or honey. Bake the apples until they are tender in a pan containing a little water. Pack the baked apples into clean hot jars. Fill the jars completely with a thin sirup made by boiling together for

2 minutes, one part of water and one part or less of sirup made from equal measures of sugar and some commercial sirup. Seal the jars.

APPLE AND BLUEBERRY SAUCE

1 quart tart apples	½ cup sirup
1 quart blueberries, fresh or canned	½ cup sugar
	2 cups water

If fresh blueberries are used, wash them and pour over them 1 quart of boiling water. Allow them to stand overnight. Of the freshly cooked or canned berries drain off the juice, and boil it until it becomes a thin sirup and coats a spoon. Add the berries and simmer them for 10 minutes.

Pare and slice the apples. Boil the sirup, the sugar, and the water for 5 minutes, add the apples, and cook them until they begin to look clear. Add the berries, and cook the mixture until the apples are clear and tender. Pour the sauce into sterilized jars and seal them.

APPLE SIRUP

Extract the juice of apples as for making jelly, by covering them with water and cooking them until they are tender. Drain the juice thru a jelly bag. Boil it until the volume is reduced about one-third. Add 1 tablespoon of sirup and 1 tablespoon of sugar for each cup of juice. Boil the mixture for 5 minutes, pour it into sterilized jars, and seal them. This sirup may be used on pancakes or in gelatin desserts, pudding sauces, or frozen desserts.

APPLE BUTTER

Wash the apples, and cut them in eighths. Cook them in a small amount of water until they are tender. Put them thru a sieve. To each cup of pulp, add 2 tablespoons of sirup and 2 tablespoons of sugar, and cook the mixture until it is thick. If the apples lack flavor, a small amount of lemon juice and grated rind may be added.

APPLE AND PLUM BUTTER

Wash and cut the apples and the plums. Use about three times as many apples as plums. Cook them in a small amount of water until they are tender. Put the cooked fruit thru a sieve. To each cup of fruit pulp, add ⅓ cup of sirup and ⅓ cup of sugar. Cook the butter until it is thick and clear. Pour it into clean jelly glasses, and cover it with paraffin when it is cold.

APPLE AND BLACKBERRY BUTTER

Use equal parts of apples and blackberries. Wash the fruit carefully. Remove the blossom end of the apples, and cut them in small pieces.

Cook the apples and the berries in just enough water to cover them, until they are tender. Put them thru a sieve. Add one-third as much sirup and one-third as much sugar as pulp, and cook the mixture until it is thick and clear. Pour it into clean glasses, and cover it with paraffin when it is cold.

APPLE AND TOMATO CONSERVE

2 cups sour apples, diced
2 cups ripe tomatoes, cut
½ lemon, grated rind and juice
⅓ cup sirup
½ cup sugar
1 teaspoon salt

Cook the apples and the tomatoes until they are tender, without adding any water. Add the sirup and the lemon, and cook the mixture until it is clear. Turn the conserve into clean jelly glasses, and cover it with paraffin when it is cold. This conserve is slightly tart and is excellent with meats or with bread and butter.

APPLE AND PLUM CONSERVE

2 cups tart apples, diced
1 cup plums, seeded and cut
½ cup sirup
½ cup sugar

Combine the ingredients, and cook the mixture until it is thick and clear. Pour it into clean jelly glasses, and cover it with paraffin when it is cold. One-fourth cup of grated coconut may be added in place of ¼ cup of sugar before the conserve is removed from the heat.

APPLE AND CANTALOUP CONSERVE

1 quart tart apples, diced
1 cup cantaloup, diced
1 lemon, cut in small pieces
1 cup sirup
1 cup sugar

Dice the apples, but do not pare them. Cook them until they are tender in as little water as possible. Add the other ingredients, and cook the mixture until it is thick and clear. If Fall Pippin apples are used, the product is a beautiful yellow in color.

APPLE AND CARROT CONSERVE

2 cups tart apples, diced
2 cups carrots, ground or diced
1 orange, diced
1 cup sirup
¾ cup sugar
1 teaspoon salt

Cook the carrots until they are tender in sufficient water to cover them; do not drain them. Add the other ingredients, and cook the mixture until it is clear.

APPLE AND PEACH CONSERVE

2 cups tart apples, diced
2 cups peaches, cut in small pieces
½ cup sirup
½ cup sugar
½ orange, juice and grated rind
¼ cup walnuts, if desired, cut in small pieces

Add just enough water to the fruit to cover it, and cook it until it is tender. Add the sirup, the sugar, and the orange juice and rind, and cook the mixture until it is thick and clear. Add the walnuts, and turn the conserve into clean glasses. When it is cold, cover it with paraffin. This conserve somewhat resembles orange marmalade.

APPLE AND BEET CONSERVE

1 cup tart apples, chopped
1 cup beets, chopped
2 tablespoons sirup
2 tablespoons sugar
Juice of ½ lemon

Pare the beets, and put them thru a food chopper. Cover them with water, and cook them until they are tender. Remove the cores from the apples, and put the apples thru the food chopper. Add the apples, the sirup, the sugar, and the lemon juice to the beets, and cook the mixture until it is clear. Turn it into sterilized jars, and seal it. Instead of storing the conserve in jars, it may be spread on a platter and dried in a slow oven or in the sunshine. It should then be packed between paraffin paper in containers that will be free from dust and insects.

PRESERVED APPLES AND PEARS

Use equal measures of tart apples and pears. If the pears are rather hard, they should be cooked first in boiling water until they are tender. In this case the water in which they are cooked should be used in place of water that is called for.

Boil ½ cup of sirup, ½ cup of sugar, and 1 cup of water for 5 minutes. Add the fruit, and cook it rather rapidly at first, then more slowly until the fruit has a clear appearance. If the apples lack acidity, add one or two slices of lemon. Seal the mixture in sterilized jars.

APPLE RINGS

Red apples are best for making rings. Baldwins are excellent. The apples should be firm and free from blemishes. Remove the cores with an apple corer; do not pare the apples. Cut them in slices about ¼ inch thick, or if desired cut them in eighths. To ½ cup of sirup and ½ cup of sugar, add ½ cup of water. Bring this mixture to the boiling point, add the rings, and cook them rather slowly until they are tender. Lift them on to a plate to drain. Lay them on a cheesecloth on a screen to dry. Do not cook too many rings at one time; they must not be crowded.

When the rings are dry, they should be deep red in color, and should have a glazed surface. When they are glazed and no longer sticky, wrap them in oiled paper, and keep them in a cool dry place. They will keep indefinitely, and are excellent as garnishes for various desserts, such as gelatins, cornstarch puddings, and frozen desserts.

GINGER APPLES

Any apple that holds its shape well in cooking is good for ginger apples. Ben Davis apples are excellent for this purpose. Pare the apples, and cut them in quarters. Cook them in boiling water until they are tender. Boil $\frac{1}{2}$ cup of sirup, $\frac{1}{3}$ cup of sugar, 1 cup of water, and 2 tablespoons of preserved ginger cut fine, or a piece or two of ginger root, for 5 minutes. Add the apples, simmer them until the mixture is thick and clear, and seal it in sterilized jars.

PICKLED APPLES

2 cups apples, cut in eighths	1 cup water
$\frac{1}{2}$ cup sirup	Cinnamon stick
$\frac{1}{4}$ cup sugar	Cloves
$\frac{1}{4}$ cup vinegar	3 slices lemon

Bring the sirup, the sugar, the vinegar, the water, and the spices to the boiling point. Add the apples; if they are a variety that will hold their shape well, they should be cut in fairly thin slices in order that the flavor of the pickle solution may penetrate. Cook the mixture slowly until the apples are clear and tender. Seal it in clean jars.

APPLE CATSUP

1 quart tart apples, diced	$\frac{1}{8}$ teaspoon turmeric
1 cup celery, cut fine	1 cup water
1 red pepper, minced	$\frac{3}{4}$ cup vinegar
2 green peppers, minced	$\frac{1}{3}$ cup sirup
$\frac{1}{4}$ cup minced white onion	$\frac{1}{3}$ cup sugar

Paprika, salt

Combine the ingredients, and simmer the mixture until it is clear. Seal it in sterilized jars.

APPLE CHUTNEY

1 quart tart apples	1 cup water
1 cup raisins	$\frac{1}{4}$ cup sirup
2 medium-sized onions, minced	$\frac{1}{4}$ cup sugar
2 red peppers, minced	1 tablespoon white mustard seed
$\frac{1}{2}$ cup vinegar	1 teaspoon celery seed

Paprika, salt

Combine the ingredients, and simmer them until the apples are tender and the mixture is thick and clear. Seal it in hot sterilized jars. It may be necessary to add more water if the apples are not juicy.

DRIED APPLES

Apples that are firm and in good condition should be selected for drying. Pare, core, and cut the apples in eighths; or, better, core them and slice them in rings $\frac{1}{8}$ inch thick, using a fruit or vegetable slicer. Since the apples discolor quickly, do not let them stand long before drying them.

To prevent discoloration, as the fruit is prepared it may be dipped for one minute in a cold salt bath, made in the proportion of 1 ounce ($2\frac{1}{2}$ tablespoons) of salt to 1 gallon of water. Remove the surface moisture, and dry them at 110° to 150° F., raising the temperature gradually. Dry

FIG. 1. YIELD OF JELLY FROM FIVE POUNDS OF NORTHERN SPY APPLES

them for from 4 to 6 hours, and longer if necessary. The fruit is sufficiently dry when a handful of slices, gripped in the hand, has an elastic feel, separates promptly when the pressure is released, and leaves no visible moisture on the hand.

Allow the apples to remain out in the air for two or three days, stirring them occasionally, and store them in pasteboard boxes or paper bags which will be free from insects and dust.

APPLE PASTE

Apple paste is one of the best ways of utilizing apples; it is easy to make, it requires little or no sweetening, it keeps well, and, since it is concentrated, it requires the minimum storage space. A small amount of sweetening improves the flavor but is not necessary. The paste may be used as a confection, or as a garnish for desserts, or it may be soaked and cooked for sauce.

Three parts of apples may be combined with one part of other fruit, such as pears, plums, berries, cherries, elderberries, or peaches. If berries with many seeds are used, they should be put thru a strainer. If peaches are used, the stones should be crushed and the kernels ground and added to the paste; this gives an excellent flavor, resembling that of nuts.

Prepare apple pulp as for making apple butter, by cooking the apples and putting them thru a sieve. Cook the pulp until it is very thick, stirring it to prevent sticking. Measure the pulp, and add 1 tablespoon of sirup and 1 tablespoon of sugar to each cup of apple pulp. Cook the mixture until it is clear. Grease a plate slightly with a little oil or any unsalted fat. Turn the paste onto the plate, and place it in a slow oven or an airy place to dry. When a film has dried over the top, turn the paste onto cheesecloth and dry it. When it is sufficiently dry, lay it

Fig. 2. Yield of jelly from five pounds of Ben Davis apples

on a piece of oiled paper and roll it in a small roll. Turn the ends of the roll under, and store the paste in a cool dry place.

DRIED APPLE SAUCE

Bright-colored apples, such as Baldwins, are to be preferred for dried sauce. Wash them, and cut them in dice. Do not pare them. Cook them in a small amount of water until they are tender. Add 2 tablespoons of sirup for each cup of sauce, and cook the mixture until it is clear. If desired, a small amount of grated lemon peel may be added, or a small stick of cinnamon. Dry the sauce according to the directions for paste. This sauce is less trouble to make than paste and is excellent; it may be used in the same ways.

APPLE AND CARROT PASTE

Use an equal measure of tart apples and carrots. Cook the carrots until they are tender in sufficient water to cover them, and put them thru a grinder.

Do not pare the apples, but grind them or cut them fine. Add them to the carrots, add more water if necessary, and simmer the mixture until the apples are tender. Add 1 tablespoon of sirup to each cup of the mixture, and sufficient grated lemon rind and juice to give the desired flavor. Turn the mixture onto greased platters and dry it according to the directions for apple paste.

CONSERVATION JELLIES

During the present sugar shortage, it is desirable to use glucose, commercial corn sirup, or other light sirups in place of part of the sugar ordinarily used in making jelly. Corn sirup may be used in the proportion of ½ cup of corn sirup and ½ cup of sugar to 1 cup of juice, or ¾ cup of corn sirup and ¼ cup of sugar to 1 cup of juice.

Apple juice may be combined with other juices, such as grape or tomato, to make excellent jelly. The juices should be extracted separately in the usual way, then combined and boiled for 5 minutes before the sweetening is added.

APPLE JELLY

Some varieties of apples give a better flavor, texture, and color when made into jelly than do others. All the apples in the following list may be considered good for jelly with the exception of Ben Davis and McIntosh.

In a series of experiments, five pounds each of the following varieties of apples with three extractions of juice yielded sufficient jelly to fill the number of five-ounce jelly glasses here indicated:

	Number of glasses
Rhode Island Greening	21
Esopus (Spitzenburg)	20
Baldwin	20
Strawberry	20
Red Astrachan	18
Tompkins King	18
Oldenburg (Duchess)	18
Northern Spy	16
Fall Pippin	15
McIntosh	12
Ben Davis	7

To make apple jelly, extract the juice from the apples in the usual way. Boil the juice for 5 minutes, or until the pectin test is obtained. Add ½ cup of corn sirup and ½ cup of sugar for each cup of juice, and cook the mixture until the jelly test is obtained. Pour the jelly into sterilized glasses, and cover it with paraffin when it has stiffened. Three-fourths cup of corn sirup and ¼ cup of sugar may be used.

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APRIL, 1919 THRIFT SERIES LESSON 123

A PROGRAM OF THRIFT FOR NEW YORK STATE

FLORA ROSE AND MARTHA VAN RENSSELAER

Among the legacies of the war are two that must be shared by all the people.

One of these legacies is a world shortage of many materials, and a necessary disturbance in the adjustment of labor and time in resuming normal production. This touches every one closely, since it has caused a rise in prices that has made even the bare necessities of life scarce and expensive. Therefore, if the American people wish to prosper, and if they are to claim no more than their share of the goods of the world, they must use materials with greater care than has been their custom in the past. In general, they must buy and use what they need instead of what they desire.

The second legacy is a large national debt. A national debt belongs to each citizen, since it is incurred for his good and his protection. It must be paid by the people. If the reserves of materials and money necessary for both personal and national prosperity are to be accumulated again, it must be thru the efforts, the sacrifices, and the savings of the people.

The American people are awaking to the situation. Not only are they beginning to realize the need to spend money carefully, but they seem to have in addition a very real desire to do so. Everywhere they themselves are asking for some program of thrift that will aid them to pay both their personal debts and those of the Nation, and also to make the best use of their money. It is in response to their demand that the following program is suggested for the men, women, and children of New York State.

THE MEANING OF THRIFT

Thrift implies careful spending, maximum earning, and no wasting. Thrift means much more than the accumulation of a savings account.

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It means careful and well-considered use of materials as well as money, for even the wise use of money, basic as it is to thrift, is only one phase.

Thrift means wise direction of time and effort. It means protection of health. Finally, it means intelligent care of human beings by the community, the State, and the Nation.

The best way to begin a thrift movement is by studying simple household problems. From this individual inspection the larger social phases of thrift in community life must develop.

SUGGESTIONS FOR THRIFTY LIVING

The following program of action is suggested to assist individuals or households to practice thrift:

1. **Make a complete statement of your individual or family income.**

   This should include money and its material equivalents derived from all sources, such as salary or earnings; interest on investments; gifts or other sources of money income; income equivalents, such as food, fuel, shelter, and possibly clothing and furnishings.

   Buildings occupied without the payment of rent, food, fuel, or other materials that are produced and used on the place, are money equivalents of income and may be estimated as such.

2. **Study carefully your income and its sources.**

   What is the capital value of your income if you figure it as six per cent interest on an investment?

   Is the investment represented by your income protected against loss or damage? Are there ways in which your income could be legitimately increased? The lesson entitled *Self-Study Outlines for Promoting Thrift* gives suggestions for more detailed study on this subject.

3. **Study the effect of individual characteristics on expenditures.**

   What characteristics are assets to the income? What characteristics are liabilities to the income?

   The following characteristics, at least, should be included in this study: health; habits; ability to serve; skill or training as a user of income; care of property; standards of living.

   The lesson entitled *Self-Study Outlines for Promoting Thrift* gives suggestions that will enable a person to study thoroly those personal traits that influence the use of the income.

4. **Begin a careful cash account.**

   Only by having a record of your daily, monthly, and yearly receipts and expenditures will you be able to determine whether your money is being wisely spent.

5. **Put yourself or your household on a budget basis.**

A budget is a plan for using the next year's income. A plan generally encourages careful use of money, materials, and time. The budget is most helpful to persons who know in advance what the income is to be. Farmers, whose income depends in large measure on weather and prices, and others whose income is uncertain, cannot follow a definite budget, but estimates in advance are helpful. To make a budget:

a. Make a statement of the income.

b. Estimate, as nearly as you are able to do, how much and what proportion of last year's income was spent for each of the following groups:

Food	Education
Clothing	Savings
Shelter	Benevolences and gifts
Operating expenses	Recreation and luxuries
Health	

c. Study each expenditure to determine whether it might have been decreased without injury to yourself or some member of the family. If you feel that you have overspent on certain items, try to analyze the cause.

d. Decide what part of next year's income should be spent for each group.

e. Weigh the effects of the personal characteristics of yourself or each member of the family on the income. Plate the assets in one column and the liabilities in another. If you determine to decrease the list of characteristics noted as liabilities, plan the budget on this basis, and try to live within the amount.

The lesson entitled *Making a Budget* gives a foundation for working out the individual or family budget.

6. **Train yourself to buy wisely.**

Study in detail each group that you have placed in your budget. Learn how to buy, what to buy, when to buy, and where to buy.

The lesson entitled *What to Spend for Food* may be used as a beginning for such study.

7. **Learn how to invest your savings.**

Investigate reliable ways of investing money. Liberty bonds are a safe security with moderate interest rate. In general, the safer the investment, the lower is the return.

8. **Study the problems that arise in making a budget for your income.**

The following problems are given as suggestions:

Shall goods be paid for in cash, or be charged?

Shall a common checking account be established for husband and wife?

Shall the household be run on an allowance basis? What amount of money is necessary to support the individuals in the family? to buy bare necessities? to buy some comforts? to provide for the future?

Should a minimum of work be required of all adults regardless of the size of the income?

Shall the children have an allowance? What items shall such an allowance cover?

What constitutes acceptable standards of living in respect to food? to clothing? to shelter? to education? to savings? to recreation?

CARRYING OUT A PROGRAM OF THRIFT

Self-help is the best help in carrying out a program of thrift. Individuals, families, and communities differ to such a degree that it is impossible to furnish any detailed plan that will adapt itself to all. However, some specific help in the form of publications is now available.

1. **Publications on thrift.**

The Department of Home Economics, of the New York State College of Agriculture, has prepared a series of publications to suggest to the individual or the family ways of putting into effect the thrift program. Any man, woman, or child, or group of men, women, or children, in New York State who wish seriously to work out this project, may obtain the following publications by writing to the Department of Home Economics:

Making a Budget, to give a sound basis for dividing the income.

Self-Study Outlines for Promoting Thrift, to help the user of the income in studying the conditions that affect his expenditures, and to help the individual study the conditions that modify his earning power.

How to Keep a Cash Account, to show how a beginning may be made in keeping a record of receipts and expenditures.

What to Spend for Food, to give a basis for determining what proportion of the income should be spent for food.

Points in Selecting the Daily Food, to give a basis for the selection of right foods.

Suggestions for topics which those who are interested in thrift may wish to have treated, may be sent to the Department of Home Economics, New York State College of Agriculture.

2. **Local assistance.**
   Assistance in carrying out a thrift program may generally be obtained from local persons who may be well fitted to advise. The interest of commercial firms may be aroused on problems of buying. Banking institutions may give advice on safe ways of investing money. Physicians and nurses may aid on health problems. Dressmakers may give advice on clothing problems. Various social and educational organizations may be called upon for assistance and direction. In counties having a home demonstration agent, organizations or groups may call on the agent for help in starting a project.

A COMMUNITY PROGRAM OF THRIFT

Thrift should receive the attention of the community as a whole; it should not be limited to the individual or to the household. All men, women, and children in the State may take an active part in the thrift movement, both individually and collectively; it has a social as well as an economic basis.

1. **Organizations of men, women, boys, and girls.** A thrift program may well be adopted as a part of the year's work by organizations in the community, whether of men, women, or children.
   - Groups organized for purposes other than study should survey their activities to determine in what ways they can practice thrift better than they have done in the past.
   - Groups organized for study should make a place on their program for discussion of thrift. Ten or fifteen minutes at each meeting may be devoted to some phase of thrift and the relationship that it bears to all social and economic forces in the community.
   - The publications listed on page 64 may be used as the basis of the work.
   - Programs and questions for group study and discussion have been prepared by the Department of Home Economics, of the New York State College of Agriculture, and will be furnished on request.
   - Cornell Study Clubs may be formed to study thrift. Assistance in organizing such clubs will be furnished by the New York State College of Agriculture.

2. **Schools.** With the interest of the local school board, superintendent, principals, and teachers, thrift may be discussed in the classroom in connection with the regular studies. School organizations may also arrange for debates and exhibits that will bring the importance of thrift vividly before the minds of the children.

3. **Churches.** Churches may emphasize the need for thrift, not only in sermons and in small meetings of church societies, but also in the social work done for the needy families of the community.

4. **Newspapers.** Articles that will serve to interest individuals and organizations in participation in the thrift movement may be prepared by local editors. The Department of Home Economics of the New York State College of Agriculture will send suggestions for such articles, on request, to persons wishing to assist the local newspapers in carrying on such work.

THE CORNELL READING COURSE FOR THE HOME

STATE EXTENSION SERVICE IN HOME ECONOMICS
THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
ALBERT R. MANN, DIRECTOR OF EXTENSION SERVICE
MARTHA VAN RENSSELAER, SUPERVISOR OF THE COURSE
BRISTOW ADAMS, EDITOR FOR THE COLLEGE

APRIL, 1919 THRIFT SERIES LESSON 123

A PROGRAM OF THRIFT FOR NEW YORK STATE

DISCUSSION PAPER

If you undertake to carry out a thrift project either as an individual or as a member of an organization, please fill out the attached blank and return it to the Department of Home Economics, State College of Agriculture, Ithaca, New York.

1. If, as an individual, you are beginning to carry out a thrift project, what are your plans for proceeding?

2. If, as a member of an organization, you are beginning to carry out a thrift project, what is your share as an individual? What are the plans of the organization?

3. Are you willing to send to the Department of Home Economics from time to time a statement of your conclusions, based on your experience, as to the value of a thrift project? The Department will be glad to answer questions or to assist in other ways if possible.

Name...

Address...

Date...

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APRIL, 1919 THRIFT SERIES LESSON 124

MAKING A BUDGET

MARTHA VAN RENSSELAER AND FLORA ROSE

A budget is an organized plan for using the income. By applying a budget, or plan, to the income before spending it, the same kind of advantage is derived as from adjusting all parts of a pattern to cloth before cutting a garment from it. By this method, both income and cloth may be made to yield their utmost. Difficulties may be foreseen and decisions made in advance as to what temporary sacrifices are desirable in order that the greatest final benefits may be obtained. A budget is therefore a good guide for thrifty living; other suggestions are given in another lesson in this series, *A Program of Thrift for New York State.*

Persons whose income is uncertain cannot follow a definite budget, but they can make some plan in advance of spending, which will be helpful.

The actual making of a budget should be preceded by a survey of the income and of ordinary expenditures. When possible, all members of the family should participate in making the budget. The following steps are suggested.

I. Study your income, your family, and your environment.

1. Set down a complete statement of your income.

   This should include money or its material equivalent derived from all sources, such as salary or earnings; interest on investments; gifts or other sources of money income; income equivalents, such as food, fuel, shelter, and possibly furnishings and clothing; and food or other commodity raised on the farm or in the garden.

   Incomes that are sufficiently large to maintain the individual or the family without outside aid and yet not large enough to allow for unlimited expenditures may be roughly classified into three groups:

   a. Sufficient for bare subsistence.

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Cooperative Extension Work in Agriculture and Home Economics

b. Sufficient for subsistence with the addition of a few comforts.

c. Sufficient for subsistence and a few comforts, with enough left over to give security for the future in savings and to allow for those advantages of health, education, and environment that make for good citizenship.

2. Make a study of yourself and your family.

How has each member of the family served in the past to increase or to reduce the benefits of the income? How may each one serve during the coming year to increase the benefits?

How adequately have the real needs of each member of the family been met during the past year?

3. Study your environment.

What effect has your environment on the way in which you use your income?

Are you so located as to necessitate undue expenditures for car fare?

Is the location healthful?

Does your environment encourage expenditures beyond your income, for food, clothing, shelter, recreation?

II. Make an estimate of your last year's expenditures.

1. List in the order of their importance the groups for which you spend money. A suggestive grouping is as follows:

Food	Health
Clothing	Education
Shelter	Savings and investments
Operating expenses, such as light, fuel, and the like	Benevolences and gifts
	Recreation and luxuries

2. Estimate the amount of money that you spent for each group.

What proportion of your income was spent for necessities for existence and what proportion for items that might have been omitted, tho at a disadvantage? Were your savings in proportion to your expenditures? Check those expenditures that you think might have been reduced with advantage.

III. Draft a plan for using next year's income.

1. Estimate the amount of your income that must be set aside to provide adequate food, clothing, and shelter, and for the other expenses of maintaining your household.

This first estimate should be on the basis of the minimum. Then if the income seems to warrant it, each item may be

restudied to determine at which points increasing the standard may be profitable and give increased satisfaction. For example, many persons may be willing to follow a simple tho safe diet in order to live in a more beautiful environment. Others may prefer to have a wider choice of foods and to wear simple clothes and live in somewhat cramped quarters. Still others may wish to keep all necessities to a minimum standard and increase savings or spend more money on education or other related benefits.

2. Estimate the amount of money that may remain after the necessities are provided. Study the allowance that it seems wise to make for health, education, savings and investments, benevolences and gifts, recreation and luxuries.

IV. **Keep an accurate expense account.**
The expense account should be the basis for the budget.

GUIDES IN ESTIMATING THE BUDGET

Figures that are given to aid in making the budget must be regarded more as a compass indicating a general direction than as a guidepost showing a clearly outlined road. Both conditions and prices are too much like quicksand to permit any interpretation of figures other than on this basis. The figures given in this publication are compiled from various estimates that form the basis of adequate relief in organizations caring for dependent families, and represent a standard that is barely sufficient to meet actual needs and maintain welfare. These figures indicate, therefore, not the amount that may be desirable for maintenance, but the amount that may be possible for maintenance—in other words, a minimum standard.

I. **Food**
The figures for food costs represent a minimum standard for raw materials that may be safely allowed in May, 1919, to meet the average needs of men, women, and children living under average conditions and choosing food with moderate care.

	Minimum allowance for a day	Minimum allowance for a month
For a man	$0.40 to $0.45	$12.00 to $13.50
For a woman	.35 to .40	10.50 to 12.00
For a boy 14 to 17 years of age	.40 to .45	12.00 to 13.50
For a girl 14 to 17 years of age	.30 to .35	9.00 to 10.50
For a child under 13 years of age	.25 to .30	7.50 to 9.00

The expert in dietetics might reduce this food cost safely, but it is questionable if the housekeeper can do so. Families that must be fed on less than this amount are in danger of under-nutrition. Even with this amount, great care must be exercised in the selection of food to insure right nutrition.

II. Clothing

A minimum clothing standard is much more difficult to establish than is a minimum food standard. This is largely due to the fact that there is little to show at which points a lessened expenditure for clothing begins to endanger health. Clothing standards beyond the point of mere covering for the body become personal and social. Various studies have been made, however, to determine the standard for the minimum expenditure that will maintain a genteel appearance and provide a healthful covering. The following figures may be used as a compass to point this direction.

	Minimum allowance for a month (average)	Minimum allowance for the year
For a man	$5.50 to $6.00	$66.00 to $78.00
For a woman	5.50 to 6.00	66.00 to 78.00
For a boy or a girl 14 to 17 years of age	5.50 to 6.00	66.00 to 78.00
For a child 10 to 14 years of age	4.00 to 5.00	48.00 to 60.00
For a child 3 to 10 years of age	3.00 to 4.00	36.00 to 48.00
For a child under 3 years of age	2.00 to 3.00	24.00 to 36.00

III. Shelter

The type of house that may be obtained depends on the amount of money that may be set aside after the more immediate needs for food and clothing have been met. A better shelter may be obtained if the clothing purchases are reduced to the minimum. Car fare that is necessary to carry members of the family back and forth daily to work or to school should be included in the item for shelter. If the house is owned

	Allowance for unfurnished unheated house for a month	Allowance for unfurnished heated apartment for a month
Three rooms	$10.00 to $18.00	$25.00 to $35.00
Four rooms	15.00 to 25.00	30.00 to 40.00
Five rooms	20.00 to 30.00	35.00 to 45.00
Six rooms or more	25.00 and up	40.00 and up

by the occupants, the shelter item should include taxes, insurance, upkeep and repairs, and interest on investment.

IV. **Operating expenses**

All expenses incurred in caring for food, clothing, and shelter should be included in this item; for example, fuel, light, ice, telephone, household supplies and furnishings, and all forms of service for which money is paid, such as cleaning, pressing, repairing, household help.

1. Fuel and light

The amount of money to be set aside for fuel and light is governed mainly by: size and construction of house; number of rooms to be heated; kind of fuel used; type of equipment and care in management.

To maintain a minimum standard of comfort, the amount for heating, lighting, and cooking may be:

	Minimum allowance for a month
For three-room house	\$5.00 to \$7.00
For four-room house	6.00 to 8.00
For five-room house	6.50 to 8.50
For six-room house	7.00 to 10.00

2. Household furnishings and supplies

All expenses incurred for cleaning materials, ice, telephone, and utensils, and for repairs or renewal of household furniture, linen, or other supplies, should be included under this item. A minimum for household furnishings and supplies is as follows:

	Minimum allowance for a month
For family of two	\$3.00 to \$5.00
For family of three	4.00 to 5.50
For family of four	4.50 to 6.00
For family of five	5.00 to 7.00

3. Service

Service may be one dispensable item, since all the operations connected with the care and management of the house may be conducted by various members of the family. It is not necessarily wise to save money that might be spent for service, since in many cases money spent for service may be money saved for health.

The proportion of the income that may be set aside for service is therefore a matter for individual decision. If the income is large enough to provide some comforts in addition to the bare necessities of life, a little money may be wisely spent for washing, heavy cleaning, care of clothing, and similar services.

V. **Health**

Money should be spent to safeguard health before even savings or additional education is considered. Health may indeed be regarded as the best type of investment. Study the health needs of each member of the family in order to determine whether money may be spent for protection against ill health.

VI. **Education**

Find out the earning power and the civic value of an education, and make this the basis for your expenditures for this item. Education may include such items as: school or college tuition or fees; books or periodicals; newspapers; special lessons or instruction; dues for educational organizations; travel; plays, concerts, educational motion pictures.

VII. **Savings and investments**

Every legitimate effort should be made to establish a savings account. Judgment must be used, however, to distinguish between money saved at the expense of health and welfare, and money saved by careful direction of all expenditures.

If money is earning four per cent compound interest over a period of years, it increases in amount more rapidly than the average person realizes, as the following table shows:

Monthly deposit	Monthly deposits with accrued interest				
	1 year	2 years	3 years	4 years	5 years
$1.00	$12.25	$ 24.99	$ 38.23	$ 52.06	$ 66.42
$2.00	24.50	50.00	76.54	104.14	132.86
$3.00	36.75	74.99	114.77	156.17	199.25
$4.00	49.00	100.02	153.10	208.32	265.76
$5.00	61.25	125.01	191.35	260.37	332.17

VIII. **Benevolences and gifts**

The amount set aside for benevolences and gifts should be determined at the beginning of the year. The division may be made later as occasion demands. The following subdivisions are suggested: gifts, church, charities and organizations, beneficiaries.

IX. Recreation and luxuries

Recreation overlaps to a certain extent education and expenditures for health. This item should be studied carefully in advance, and results carefully evaluated. The amount of money set aside for luxuries should be determined after all other items are estimated. In many cases luxuries are attached to such items as food or clothing; in this case analysis should be made when the amount for these items is being determined.

MINIMUM ALLOWANCES

The following summary shows the minimum allowance that may be made for necessities on the basis of prices in May, 1919.

The figures give the minimum amounts that will cover bare necessities. No attempt has been made to estimate amounts necessary to provide for good citizenship and comfort.

A minimum allowance for bare necessities for a family of two adults, a man and a woman, is as follows:

	Minimum allowance a month
Food	$22.50
Clothing	11.00
Two- or three-room house	10.00
Operating expenses	8.00
Total	$51.50

A minimum allowance for bare necessities for a family of mother, father, and one child, is as follows:

	Minimum allowance a month	
	If child is small	If child is over 13 years
Food	$30.00	$37.00
Clothing	13.00	16.50
Three- or four-room house	10.00	15.00
Operating expenses	9.00	10.00
Total	$62:00	$78.50

A minimum allowance for bare necessities for mother, father, and two children is as follows:

	Minimum allowance for a month	
	If both children are small	If both children are over 13 years
Food	$36.00	$46.00
Clothing	16.00	22.00
Four- or five-room house	15.00	20.00
Operating expenses	10.50	11.00
Total	$77.50	$99.00

A minimum allowance for bare necessities for mother, father, and three children is as follows:

	Minimum allowance for a month	
	If all children are small	If all children are over 13 years
Food	$44.00	$58.00
Clothing	19.00	27.50
Five- or six-room house	20.00	25.00
Operating expenses	11.50	12.00
Total	$94.50	$122.50

SUGGESTIVE DIVISION OF ITEMS

A suggestive division of items from which to estimate last year's expenses and to furnish a basis for this year's expense account and budget, is as follows:

Items	Expense last year	Estimated expense for coming year
FOOD		
Milk and cheese		
Fats, including butter and cream		
Sweets		
Fruits and vegetables		
Cereal foods, including bread		
Meat, fish, poultry		
Eggs		
Miscellaneous		

Items	Expense last year	Estimated expense for coming year
CLOTHING (list clothing for each member of family)		
Adult No. 1		
Outer garments		
Underwear		
Hats		
Shoes		
Accessories		
Adult No. 2		
Outer garments		
Underwear		
Hats		
Shoes		
Accessories		
Child No. 1		
Outer garments		
Underwear		
Hats		
Shoes		
Accessories		
SHELTER		
Rent or equivalent		
Car fare		
Taxes		
Insurance		
Interest		
OPERATING EXPENSES		
Fuel and light		
Furnishings and supplies		
Ice		
Telephone		
Service		
HEALTH		
Physician		
Nurse		
Medicine		
Oculist		
Dentist		
Recreation		
Miscellaneous		
EDUCATION		
Dues for educational organizations		
School or college fees		
Lessons or special instruction		
Books and periodicals		
Newspapers		
Travel		
Theater and concerts		
SAVINGS		
Investments		
Savings		
Insurance		

Items	Expense last year	Estimated expense for coming year
BENEVOLENCES AND GIFTS		
Church		
Charity		
LUXURIES		
Membership in many organizations		
Gifts		
Travel		
Many expensive amusements		
Automobile for pleasure		
Food, clothing, shelter, service beyond reasonable means		

REFERENCE

The business of the household. C. W. Taber. 1918.

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APRIL, 1919 THRIFT SERIES LESSON 124

MAKING A BUDGET

DISCUSSION PAPER

Your opinion as well as the results of your experience in making budgets may be of value to other persons. Will you answer the following questions and return this sheet to the Department of Home Economics, New York State College of Agriculture, Ithaca, New York?

1. If the minimum allowance that is herein suggested would not be adequate in your community to cover the necessities, in what respects would you change it?

2. From your experience in your community, what would be the allowance for comfort, not luxury, for your own family or another family of a given size? How would this allowance be divided among the various items?

3. If you are able to do so from your experience, state the allowance for clothing that would cover your expenditures for a year, and subdivide it as indicated on page 77.

Name..

Address..

Date..

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APRIL, 1919 THRIFT SERIES LESSON 125

SELF-STUDY OUTLINES FOR PROMOTING THRIFT

To earn one's maximum income and to make that income yield its utmost, is thrift. The size of the income is not the only factor that determines what can be bought in the way of necessities, comforts, and security for the future. The characteristics of the persons using an income are also important elements governing the benefits received. This lesson is one of a series planned to encourage thrift; other suggestions are given in *A Program of Thrift for New York State.*

OUTLINE FOR USERS OF INCOME

FLORA ROSE

To make an income yield its utmost, a systematic study of the personal traits of those using it should be made. One person may possess characteristics that lead to the use of every penny for some measurable benefit; another person may be the victim of qualities that continually lead to the spending of money, sometimes necessarily but often unnecessarily, for things that give neither present comfort nor future security. By studying personal characteristics, poor ones may be corrected and those that have been liabilities may even be transformed into assets.

Each member of a family should analyze his own effect on the benefits of the income. In addition, an analysis of the family as a whole should be made to show the distribution of total expenses among its various members.

The children in the family should measure their own relationship to the family income and learn for themselves how far they can aid in conserving it for wise uses.

The following outline suggests ways in which a person may study his own characteristics in relation to spending money. Only those characteristics have been considered that are in some degree, at least, under personal control and that may measurably affect the value of the income.

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I. Health

1. Are you spending money on your health?...
   Are you spending money to make yourself well?...
   Was your illness preventable?...
   Are you spending money to keep yourself well?...
   Is this economy?...
2. Does your health prevent your doing the reasonable amount of work that your financial condition makes necessary?...
3. What are you doing to safeguard your health?
   Do you intelligently avoid conditions that might lead to disease, and take precautions against accidents?...
   Do you give proper care to your body?...
   Do you keep your teeth clean?...
   Do you keep your teeth in repair?...
   Do you eat simple, wholesome food at regular mealtimes?...
   Do you keep your intestines clean?...
   Do you protect your eyes against strain?...
   Do your eyes need attention?...
   Do you wear comfortable, sensible shoes?...
   Do your feet need attention?...
   Do you live in well-aired, well-ventilated, clean rooms?...
   Do you breathe freely?...
   Do your nose and your throat need attention?...
   Do you maintain a cheerful atmosphere?...
   Do you go to bed early and rest as much as you should?...
   Do you exercise outdoors as much as you should?...
   Do you allow time for wholesome recreation?...

II. Habits

Are your personal habits an asset or a liability to your income?...

Are you in the habit of making your time save your income?...

Is part of your income spent extravagantly?..........
For food?..........
For clothing?..........
For entertaining?..........
For unnecessary articles?..........
For tobacco, stimulants, or drugs?..........
For gum or for sweets between meals?..........

III. **Ability to care for property**

1. Does the care that you give your property save your income?..........
2. Are you able to use to advantage all the food that you buy?..........
   Can you prepare it carefully?..........
   Do you prevent waste of any of it?..........
   At the table?..........
   In the kitchen?..........
3. Are you able to take good care of your clothes?
   Do you keep them clean and in repair?..........
   Do you protect them against unnecessary wear and tear?..........
   Do you make wise use of old garments?..........
4. Do you take good care of your personal and household possessions?..........
   Do you keep your possessions in good repair?..........
   Do you use carefully all your possessions?..........
   Do you protect them against unnecessary wear and tear and loss?..........

IV. **Ability to render personal and household service**

1. Do you decrease expenditures thru any personal service that you are able to render at home?..........
   The following questions are intended for the various members of the family, not necessarily for any one individual.
   Can you cook?..........
   Do you help prepare the food?..........
   Can you sew?..........
   Do you sew or mend?..........
   Do you make clothes?..........
   Do you make over clothes?..........

Can you do housework?..........
- Do you wash?..........
- Do you iron?..........
- Do you clean?..........
- Do you scrub?..........
- Do you dust?..........
- Do you sweep?..........
- Do you make beds?..........
- Do you wash and wipe the dishes?..........
- Do you take care of the stoves?..........
- Do you take care of the furnace?..........

Can you help keep property in good condition?..........
- Do you do any plumbing?..........
- Do you do any carpentering?..........
- Do you do any repairing?..........
- Do you do any painting?..........
- Do you take care of grounds?..........

Can you help produce food for the family?
- Do you make a garden?..........
- Do you take care of chickens?..........
- Do you take care of cows?..........

Can you be of service in other ways?..........

2. If it is not necessary for you to do such work at home to decrease expenditures, are you nevertheless working either in the home or outside to improve your home and your community?..........

V. Training as a user of income

Is your training an asset to you in spending money?..........
- Do you keep account of all your expenditures?..........
- Do you make a budget for using your income?..........
- Do you know how, when, where, and what to buy?..........
- Do you know how much you should spend for food?..........
- Do you know which foods you should buy?..........
- Can you plan wholesome, palatable, and economical meals?..........

Do you know how much you should spend for clothing? . . . . ______

Are you able to select textiles and clothing of good quality, color, and design? . . . . ______

Do you know how much you may reasonably spend for household furnishings and supplies? . . . . ______

Can you select furnishings that are economical, durable, and good in color and design? . . . . ______

VI. **Standards of living**

Are your standards of living right for your income? ______

Are your standards too high or too low for:

Food? . . . . ______

Clothing? . . . . ______

Shelter? . . . . ______

Education? . . . . ______

Health? . . . . ______

Entertainment? . . . . ______

Can you adapt your standards to your circumstances? . . . . ______

VII. **List any other characteristics that may affect expenditures**

______

______

______

______

______

OUTLINE FOR EARNERS

ELIZABETH STEER

To the wage-earner, upon whose shoulders rests the responsibility of providing as amply as possible for the needs of the family, the question of income assumes extreme importance. He begins to ask himself, "Am I earning as much money as I should earn?" "Could I earn more?" "How is this to be done?" For those who are interested in this problem the following suggestions have been prepared.

I. Study the capital value of your income.

If you figure your income as six per cent interest on an investment, how much capital may it be considered as representing? ....

For example, if your income is $1200 a year, figured on this basis it may be considered as representing an investment of $20,000 as long as the earning power continues. The earning power is limited in time, however, and an investment generally is not. The importance of safeguarding and increasing the earning power is evident.

II. How is the investment represented by your income protected against loss or damage?

1. If you have money invested in business of some kind, real estate, or other property, have you provided for adequate protection by fire and burglary insurance? ....
2. Looking upon yourself as a source of income, are you fully protected by health and accident insurance? ....
3. Have you provided by life insurance for the protection of those dependent upon you? ....

III. What ways are there of increasing your earning power?

1. Can you improve your health? ....
2. Can you improve your work? ....

   Can it be performed more efficiently with an expenditure of less energy than is now being put into it, or can that same amount of energy be made to accomplish more? ....

Is your work so organized and planned that no time nor effort is lost because of bad arrangement or illogical sequence of action? ....

Are you careless or indifferent, or have you any habit that might interfere with the quality of the work done? ....

3. Can you improve yourself? ....

Are you personally satisfied with yourself and with the position you hold? ....

If not, why not? ....

What can be done to remedy the situation? ....

Can you improve your training in any way, and so fit yourself for promotion? ....

Do you provide for leisure time and spend it in such a way that you are becoming a more perfectly developed member of society? ....

Are you steady, reliable, and thoro in everything you undertake? ....

Have you a reputation for responsibility, or are you always making excuses? ....

Are you as well informed in your particular line as it is possible to be? ....

Are you thoroly convinced of the importance and value of the work that you are doing? ....

Are you putting yourself, or merely eight hours a day, into your work? ....

From the point of view of your employer, are you as valuable as any one could be in your position? ....

If not, what can you do to make yourself more valuable? ....

Having looked yourself and your job squarely in the face, have you the will-power and determination to go ahead and make the changes necessary to the accomplishment of your purpose? ....

Questions for study similar to the foregoing may be found in the articles on efficiency published in *The Independent* during the past four years.

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THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
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MAY, 1919 THRIFT SERIES LESSON 126

HOW TO KEEP A CASH ACCOUNT

FLORA ROSE AND LOLITA E. HEALEY

If an income is to yield its greatest benefits either to the individual or to the family group, a record must be kept of the way in which it is used. Only in this way is it possible to determine whether wise use and fair distribution of the income are being made.

Persons who own their home or who have a garden or who keep animals have a slightly different problem from those who pay rent and buy everything. The amount that is saved by owning the home and by raising produce may be recorded but should be kept separate from the cash records.

I. The simple unclassified account

A simple day-to-day record of money spent, or its equivalent in materials used, and of money received will accomplish the main purpose of keeping accounts. It will give the evidence that is needed to show how money has been spent. It will further enable the spender to study all expenditures and at least ponder their necessity and wisdom.

FORM SHOWING A SIMPLE METHOD OF KEEPING ACCOUNTS

Date 1919	Record of transaction	Expenditure		Income	

Any cross-ruled book may be used for keeping an account. The lengthwise lines may be drawn in with a ruler.

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In the following example, no attempt is made to show the normal expenses of a family. The items are given merely to illustrate the various groups of ordinary expenditures.

ILLUSTRATION OF A MONTH'S ACCOUNTS KEPT IN SIMPLE FORM

Date 1918	Record of transaction	Expenditures		Income	
		Dollars	Cents	Dollars	Cents
Nov. 1	Money on hand	....	...	$ 10	00
	Salary received	....	...	125	00
	1 shirtwaist	$ 2	00	....	....
	1 boy's suit	10	00	....	....
	100 pounds of flour	6	00	....	....
	2 pounds steak		76	....	....
	1 dozen eggs		75	....	....
	Milk tickets	5	00	....	....
3	Church		25	....	....
5	Interest on investment	....	...	25	00
7	Cloth for dress	10	00	....	....
	1 pair shoes for Sam	5	00	....	....
7	Weekly total	$39	76	$160 39	00 76
Nov. 7	On hand	....	...	$120	24
	Rent	$20	00	....	....
	Deposited in Savings Bank	10	00	....	....
9	1 ton coal	7	50	....	....
	1 bushel apples	1	50	....	....
	½ bushel potatoes		60	....	....
	1 book for John		75	....	....
10	Church		25	....	....
11	Subscription to paper (6 months)	2	25	....	....
	Dentist for filling Sam's teeth	2	00	....	....
	Soap		50	....	....
	Rug for bedroom	10	00	....	....
	Repairs on sewing machine	1	00	....	....
12	1 package yeast cakes		05	....	....
	25 pounds sugar	2	00	....	....
	6 spools thread		60	....	....
	Services of cleaning woman	2	00	....	....
15	Weekly total	$61	00	$120 61	24 00
Nov. 15	On hand	....	...	$59	24
	½ dozen eggs		37	....	....
	1 pound cheese		40	....	....
	1 peck carrots		30	....	....
	1 peck onions		50	....	....
16	1 pot roast		75	....	....
	Movies		35	....	....
	Rubbers for Mary		90	....	....
	2 pairs stockings for John	$ 1	00	....	....
17	Church		30	....	....
21	Quarterly life insurance	10	00	....	....
22	Weekly total	$14	87	$59 14	24 87

ILLUSTRATION OF A MONTH'S ACCOUNTS KEPT IN SIMPLE FORM (*continued*)

Date 1918	Record of transaction	Expenditures		Income	
		Dollars	Cents	Dollars	Cents
Nov. 22	On hand	....	...	$44	37
	1 fowl, 5 pounds	$2	00	....	....
	1 pound raisins		25	....	....
23	Milk tickets	5	00	....	....
	5 pounds rolled oats		25	....	....
	1 package shredded wheat		15	....	....
	2 pounds butter	1	20	....	....
	5 pounds lard	2	00	....	....
	1 package salt		05	....	....
	1 coat for Sam	25	00	....	....
	Services of cleaning woman	2	00	....	....
24	Church		25	....	....
28	5 pounds beans		50	....	....
	3 pounds salt pork	1	20	....	....
29	25 pounds whole wheat flour	1	50	....	....
30	Concert	2	00	....	....
30	Weekly total	$43	35	$44 43	37 35
Dec. 1	On hand	....	...	$1	02

II. The classified account

An expense account becomes both more valuable and more interesting if some effort is made to classify expenses. This may be done by taking the items in the day-to-day record already shown and transferring them to a monthly summary statement in which the items are sorted into groups.

A cross-ruled notebook may be used for this account, lengthwise lines being drawn in with a ruler. The items may begin on a left-hand page and extend across two pages of the book. This form easily shows what proportion of the income has been spent on various necessities and comforts. The children may well be encouraged to take charge of this monthly summary.

FORM FOR DIVISION OF MONTHLY EXPENDITURES INTO GROUPS

Food			Clothing			Shelter		
Items	Amount		Items	Amount		Items	Amount	
100 pounds flour	$6	00	Shirtwaist, Mary	$2	00	Rent, house	$20	00
2 pounds steak		76	Suit, John	10	00			
1 dozen eggs		75	Cloth, dress, Mary	10	00			
Milk tickets	5	00	Shoes, Sam	5	00			
1 bushel apples	1	50	6 spools thread		60			
½ bushel potatoes		60	Rubbers, Mary		90			
1 package yeast cakes		05	2 pairs stockings, John	1	00			
25 pounds sugar	2	00	Coat, Sam	25	00			
½ dozen eggs		37						
1 pound cheese		40						
1 peck carrots		30						
1 peck onions		50						
1 pot roast		75						
1 fowl	2	00						
1 pound raisins		25						
Milk tickets	5	00						
5 pounds rolled oats		25						
1 package shredded wheat		15						
2 pounds butter	1	20						
5 pounds lard	2	00						
1 package salt		05						
5 pounds beans		50						
3 pounds salt pork	1	20						
25 pounds whole wheat flour	1	50						
Monthly total Food	$33	08	Clothing	$54	50	Shelter	$20	00

Form for Division of Monthly Expenditures into Groups (*continued*)

Operating expenses			Health			Education		
Items	Amount		Items	Amount		Items	Amount	
1 ton coal	$7	50	Dentist, Sam	$2	00	Book, John	$0	75
Soap		50				Subscription to paper	2	25
Rug, bedroom	10	00				Concert	2	00
Repair sewing machine	1	00						
Service	2	00						
Service	2	00						
Monthly total Operating expenses	$23	00	Health	$2	00	Education	$5	00

FORM FOR DIVISION OF MONTHLY EXPENDITURES INTO GROUPS (*continued*)

Savings and investments			Benevolences			Recreation and luxuries		
Items	Amount		Items	Amount		Items	Amount	
Deposit, Savings Bank	$10	00	Church	$0	25	Movies	$0	35
Insurance	10	00	Church		25			
			Church		30			
			Church		25			
Monthly total Savings	$20	00	Benevolences	$1	05	Recreation and luxuries	$0	35

The same purpose may be accomplished by placing the simple cash account on the left-hand sheet of a notebook and ruling columns for each of the groups on the right-hand sheet. The transactions are entered as before on the left-hand sheet, and are immediately or at the end of the month extended into their proper columns on the right-hand sheet.

The questions that a classified cash account should answer are:

1. Has an undue amount of money been spent for any single group of items? Can this be explained reasonably as being due to the season or to a similar cause? Was it necessary, or could it be prevented another time?

2. Has too little money been allotted to any one item, and should the amount be increased if possible another year?

3. Has there been a fair division of expenditures among the various members of the family?

4. Have any luxuries been bought at the expense of necessities or comforts?

5. Is it possible to increase savings without undue sacrifices?

FORM FOR THE SIMPLE ACCOUNT AND THE DIVISION OF EXPENSES

(Left-hand page) (Right-hand page)

Date 1918	Record of transaction	Expenditures	Income	Food	Clothing	Shelter	Operating expenses	Health	Education	Savings and investments	Benevolences	Recreation and luxuries
Nov. 1	Money on hand		$ 10 00									
	Salary received		125 00									
	1 shirtwaist	$ 2 00			$ 2 00							
	1 boy's suit	10 00			10 00							
	100 pounds flour	6 00		$6 00								
	2 pounds steak	76		76								
	1 dozen eggs	75		75								
	Milk tickets	5 00		5 00								
3	Church	25									$0 25	
5	Interest on investment		25 00									
7	Cloth for dress	10 00			10 00							
	1 pair shoes for Sam	5 00			5 00							
	Weekly total	$39 76	$160 00	$12 51	$27 00						$0 25	
	Cash on hand	120 24										
		$160 00	$160 00									
	Balance on hand		$120 24									

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MAY, 1919 THRIFT SERIES LESSON 127

WHAT TO SPEND FOR FOOD

Compiled and adapted by

FLORA ROSE

The health and ability of each member of a family depends in large measure on the quantity and the kind of the daily food. In dividing the income, therefore, the first consideration is to determine how much money must be spent on food in order to insure health and efficiency. It is always poor economy to attempt to decrease or limit the food budget on any but a scientific basis. A weekly or monthly allowance of the various foods may be calculated from the daily amounts stated, and in this way the diet of past months may be easily surveyed for adequacy.

AMOUNT OF MONEY TO ALLOW FOR FOOD

1. Decide first which foods must be bought in order to insure health. Estimate about how much these will cost a day and a month. This will give the least amount of money that will furnish nourishment on a safe basis.
2. If the cost of these necessary foods falls below the amount that can reasonably be spent for food, study the best ways of spending any additional sum to improve the flavor and attractiveness of the diet.

FOODS NEEDED TO INSURE HEALTH AND WELFARE

1. **Milk. Buy at least 1 pint of milk a day for each child and 1/3 pint for each adult. If possible buy 1 quart of milk a day for each child and 1/3 quart for each adult.**

   The grown person may use cheese to replace part of his milk allowance; 1.8 ounces of cheese is about the equivalent in food value of ½ quart of milk.

   The grown person may use skimmilk to replace part or all of his milk allowance. If the child is allowed 1 quart of milk a day,

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one-half of this may be skimmilk, if necessary. All whole milk would be better. The child will not thrive without at least ½ pint of whole milk a day. Children suffer from lack of milk more than do grown persons.

2. **Fruits and vegetables. Spend about as much money each day for fruits and vegetables for each member of the family as is spent for from 1/3 to 1/2 quart of milk.**

This direction assumes that a safe quantity of milk is being bought.

If there are six persons in a family, the least amount that should be spent for fruits and vegetables will be equal to the amount spent for from 2 to 3 quarts of milk.

The two great factors of safety in the human dietary are, first, milk, and second, fruits and vegetables. It is unwise to economize too closely on these important foods.

This allowance for fruits and vegetables presupposes care in buying and does not allow for out-of-season and expensive fruits or vegetables. It includes potatoes as well as other vegetables.

3. **Fats. Buy at least from 2 to 3 ounces of fat in some form for each grown person each day.**

If necessary this may include, besides pure fat, the fat in food, such as fat meat, fat in milk and cheese, fat in eggs.

Children will obtain a large part of the fat they need from their quart of whole milk. If the child receives less than a quart of whole milk a day, provision must be made for including some fat in other forms.

Butter is the best fat to buy for little children, if the income permits.

4. **Sugars and other sweets. If money is scarce, buy only from 1 1/2 to 2 1/2 ounces of sugar or other sweeteners for each member of the family each day.**

This amount will make the food palatable.

Sugar is a cheap food, but it has a limited use in the body. Therefore, when the allowance for food is small, too much money spent for sugar cuts down the amount left for foods that are more needed.

5. **Bread, breakfast foods, and other cereals. After estimating the cost of milk, fats, sugars, vegetables, and fruits, allow from 1/5 to 2/5 of this amount for buying bread, breakfast foods, and other cereal foods such as rice, macaroni, and hominy.**

Cereal foods must be the mainstay of any economical dietary.

If the larger quantities of other foods suggested are bought, the smaller quantity of cereal foods may be sufficient.

If cereal foods made from the whole grain are used, such as rolled oats, oatmeal, cracked wheat, water-ground cornmeal, whole wheat, and graham flour, a saving is effected, since these are the cheapest sources of iron in the diet.

Less cereal foods will be needed if some dried beans, peas, and lentils are used, or if potatoes are used in large quantities.

One average serving of cooked dried peas or beans, or one medium-sized potato, may be used to replace one serving of breakfast food or one medium-sized slice of bread.

6. **Meat and meat substitutes. Not more than 1/5 of the average food allowance of the moderate income should be spent for meat, eggs, fish, and poultry.**

   Meat and meat substitutes are not essential to health. They contribute so greatly, however, to the flavor, variety, and quality of a dietary, that when possible a moderate allowance should be made for them.

HOW TO BUY BEYOND THE NECESSARY FOOD

If money remains in the allowance for food after buying the foods necessary for health, spend it to increase the variety and flavor of the meals.

A plain but safe dietary may be insured by buying the foods already listed. Meals may be made more interesting, however, if there is enough money to buy the following wider range of foods:

1. **Eggs. Eggs may be added in larger amount.**

   They increase greatly the possibilities of giving variety to meals, and are in addition a very desirable food.

2. **Meat. More money may be spent for meat.**

   If a sufficient quantity of milk, vegetables, and fruits has been bought and money remains, more may be spent for meat.

   Meat is one of the most highly-prized flavor foods. The grown persons in the family may appreciate its use once a day.

3. **Vegetables and fruits. More money should be spent for vegetables and fruits.**

4. **Milk, cream, butter, fats. The maximum amount of milk recommended should be bought; then money may be spent for cream and for butter if the income allows.**

   The total amount of fat in the diet may be somewhat increased.

5. **Sweets. More money may be spent for sweets.**

   It is never wise, however, to plan to include a large amount of sweet foods, since these may prevent the use of a right foundation diet.

HOW TO DIVIDE THE MONEY SPENT FOR FOOD

The following simple general rule for dividing the money that is to be spent for food may not be effective with an extremely low-priced dietary, but it will fit average conditions.

Spend the food allowance in the following way: $\frac{1}{5}$ for milk; $\frac{1}{5}$ for vegetables and fruits; $\frac{1}{5}$ or more for cereals and cereal foods; not more than $\frac{1}{5}$ for meats and meat substitutes; $\frac{1}{5}$ for fats, sweets, and miscellaneous articles.

MINIMUM ALLOWANCE FOR FOOD

The minimum amount of money that must be allowed for food as a basis for a dietary may now be estimated.

The following estimates of amounts of food are intended to indicate only what may be regarded as the lowest standard for a possibly safe diet. No attempt has been made to give actual costs, since food prices are unstable and variable at present. Minimum needs for food are as follows:

1. Milk — For each grown person allow $\frac{1}{3}$ pint; for each child, 1 pint.
2. Fruits and vegetables — Allow for each person the amount that can be bought for the cost of $\frac{1}{3}$ quart of milk.
3. Fats — For each grown person allow 2 ounces; for each child, because of the small amount of milk, from $1\frac{1}{2}$ to 2 ounces.
4. Sweeteners — Allow for each person, because of the small amount of milk and fat, $2\frac{1}{2}$ ounces.
5. Cereal foods —Allow an amount equivalent in price to about $\frac{1}{5}$ to $\frac{2}{5}$ of the total cost of all the foods just listed, in the dietary of a family of adults.
6. Meat and meat substitutes — Not more than $\frac{1}{5}$ of the total money spent for food should be spent for meat. Less than this may be necessary, or no money may be allowed for this item.

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JUNE, 1919 THRIFT SERIES LESSON 128

POINTS IN SELECTING THE DAILY FOOD

FLORA ROSE

Successful feeding of human beings does not depend on a scientific knowledge of food values. If it did, there would be no problem of world wars, for there would be too few people in the world to fight them. This is not to say, however, that a scientific knowledge of foods is not desirable and valuable. It is like life insurance or savings: it is a safeguard against very possible disaster, and a protection against future difficulties. It adds measurably to the security of health and welfare. This is particularly true in modern times, when methods of manufacture and even of production have so changed the quality of some of our common foods that we no longer dare rely on inherited tradition to guide us in selecting them.

It becomes increasingly desirable, therefore, for human beings to learn a few of the facts that govern right nutrition. Unfortunately there is a common belief that great difficulties must be surmounted in order to acquire a working knowledge of a right choice of foods. This is not the truth. The main facts of nutrition may be presented simply, and any average man or woman, girl or boy, may readily become a possessor of these facts and put them into effect in daily life.

THREE NEEDS OF THE BODY FOR DAILY FOOD

Each food that is included in the daily meals should be chosen to satisfy at least one of the three needs of the body. You need three things from your daily food:

1. **You need fuel.**

   Your body must have the energy needed to do its work and to keep it warm.

   The more you make your body work, the greater is the amount of fuel that you must feed it.

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If you do not give your body fuel enough to do its work and to keep it warm, it will burn some of its own tissue. You will grow thin.

If you give your body more fuel than it needs, either you may grow fat or you may clog the machinery of your body.

The need of the body for fuel is not unlike the need of an automobile for gasoline or of a furnace for coal. No machine nor heating plant can run without a fuel supply.

2. **You need building material.**

All parts of your body — muscles, bones, nerves, blood, and the rest — must be fed with those substances that keep them in repair or make them grow.

If you fail to supply these building materials to your body, it will become worn out and damaged.

The need of your body for building material is like the need of a house for new shingles, the need of a sewing machine for a new wheel, or the need of an automobile for a new tire.

No good machine can be made without the right materials, nor can it endure without repairs.

3. **You need body-regulating substances.**

Your body must be kept supplied with materials needed to make it do its work.

Without regulating substances, your body could not burn its fuel normally. It could not set its building materials in place. It could not eliminate its wastes. It would cease to grow. Friction would occur. The machinery of your body would be damaged.

The need of your body for regulating substances is like the need of the sewing machine for oil, or the need of kindling for a match to set it afire. Most machines need some regulators. The human machine, which is self-built, self-started, self-regulated, self-perpetuated, needs them most of all.

WHAT YOU SHOULD KNOW ABOUT THE THINGS YOU EAT

You need to know three things about the food you eat:

1. You need to know which substances in foods give them their fuel value, and which foods are best to select as fuel for your body.

2. You need to know which substances in foods build tissue, and which foods are best to select for each needed building material.

3. You need to know which foods give you the body-regulating substances in the form in which you can use them to the best advantage.

I. **Foods that supply most of your daily fuel.**

Foods that supply most of your daily fuel are starches, fats, sugars, and proteins.

1. *Starch*

Much of the day's fuel should be supplied by foods rich in starch. These are:

Breakfast foods, such as oatmeal, cornmeal, barley, and wheat
Breads of various kinds
Vegetables rich in starch, such as potatoes
Dried peas, beans, lentils

Starch is the most abundant and the cheapest of all fuels. The body can use more starch than fat or sugar without disadvantage to itself.

2. *Fat*

Some of the day's fuel should be supplied by foods rich in fat. These are:

Milk	Bacon
Cream	Fat meat
Butter	Meat fats
Cheese	Vegetable fats and oils
Eggs	Nuts

A pound of fat gives about two and one-fourth times as much energy as a pound of sugar or a pound of starch. Foods rich in fat, therefore, have a comparatively high energy value.

Too little fat in the day's meals causes the food to pass rapidly from the stomach and gives a feeling of emptiness.

Too much fat may cause the food to remain overlong in the stomach. It may give rise to serious digestive disturbances.

The greater the amount of physical work, the greater is the capacity for using fat.

Too little fat may cause a stunting of growth. This is because of a growth-promoting substance contained in certain fats. Such fats are:

Milk fat	Cod-liver oil
Egg fat	Fat in meat, to some extent

3. *Sugar*

The day's meals are more palatable if some of the day's fuel is supplied by foods rich in sugar. Avoid too much highly sweetened food, since it destroys the desire for less highly flavored but more necessary food. Foods containing sugar are:

Sweet fruits	Honey
Vegetables	Molasses and sirups
Desserts	Sugar

4. *Protein*

A part of the day's fuel is always supplied by foods rich in a substance called protein. The body needs protein because of its value as a building material.

The energy that it furnishes may be regarded as a by-product. Protein as a building material is discussed in more detail below.

II. **Foods that supply building materials**

There are four conspicuous building materials that you should plan to include in your daily meals. If you include enough foods rich in these, the other building materials needed will probably be present. These four building materials are:

1. *Protein*

Protein is a flesh-making material. There are animal proteins and plant proteins.

Some of the day's protein should be given by one of these animal foods:

Milk	Meat
Cheese	Fish
Eggs	

A large part of the day's protein may be given by these plant foods:

Breakfast foods, such as oats, wheat, corn, barley
Breads of various kinds
Dried peas, beans, lentils
Nuts

A part of the day's protein should be given by:

Vegetables
Fruits

If you have a pint of milk a day, or two eggs or two ounces of cheese or two moderate-sized slices of meat, or any combination of these, you will probably have enough animal protein to meet your needs. An additional egg, glass of milk, piece of cheese, or piece of meat may be of advantage to you.

Milk is the best food containing animal protein for little children.

Children cannot grow without ample protein. Some of this must be supplied by animal foods. The remainder should be supplied by plant foods.

Adults need protein but will not suffer so seriously as will little children if their supply of animal protein is scant.

2. *Lime*

Lime is a bone-making material. It also serves other useful purposes.

The cheapest and most valuable lime-containing food is:

Milk

Next to milk in value as sources of lime are:

Cheese
Eggs

Leaves and stems of plants, such as:

Spinach
Cabbage
Onions
Celery

Hard water also supplies some lime in the dietary.

The dietary is more likely to contain too little lime than too little fuel or protein.

Lime is especially needed by growing children, by the expectant mother, and by the mother nursing her baby. Children cannot grow without lime; grown persons suffer without it.

A lack of milk in the diet of little children may result in a serious lack of lime.

3. *Iron*

Iron is the material that makes red blood.

The cheapest iron-containing foods are:

Breakfast foods and breads in which the outer layers of the grain are included

The most valuable source of iron is:

Green vegetables

Other valuable sources of iron are:

Eggs
Fruit
Vegetables
Meat

Iron is necessary for good blood. Neither children nor adults can thrive without it.

Women, girls, and children should have a dietary particularly rich in iron.

Milk is poor in iron, but the iron that it contains is valuable. A baby's welfare is safeguarded by storage of sufficient iron in its system to last thru from nine to twelve months of maternal nursing. After the baby is weaned, its diet should contain foods rich in iron.

4. *Phosphorus*

Phosphorus is a bone-making material. The body cannot grow without it. It serves other equally useful purposes in the body.

Foods that are especially rich in phosphorus are:

- Breakfast foods and breads in which the outer layers of the grain are included
- Dried peas, beans, lentils
- Milk
- Eggs
- Meat

Phosphorus is necessary for the growth of bones, teeth, and flesh.

Too little food that contains phosphorus will produce undernourished individuals.

III. **Foods that supply body-regulating substances**

Regulating the processes of the body is as important as building its tissues. All substances in foods play some part in regulating the body. It is necessary, however, to take special precaution to insure the presence of certain regulating substances.

In planning or selecting the day's meals you should be sure to select some food from each of these groups:

1. *Laxative substances*

The day's food should contain laxative substances. These will be supplied by using foods from both the following groups:

Fruits Vegetables	and	Breakfast foods and breads in which the outer layers of the grain are included

Acids and salts in fruits and vegetables stimulate a flow of the digestive juices and act also as chemical stimulants to the activity of the muscles of the intestinal tract.

Fibrous material in fruits and vegetables, and in the outer layers of edible seeds such as rolled oats or whole wheat, acts as a mechanical stimulant to the intestinal muscles.

Water aids in the elimination of waste products. One prevailing cause of constipation is the habit of drinking too little water.

2. *Substances to prevent scurvy*

Not much is yet known about the cause of scurvy, but it is believed that safety lies in eating daily:

Fresh fruits
or
Fresh vegetables

Scurvy is a disorder that seems to develop in the absence of certain characteristics or substances in some foods. At least one thing seems

to be more or less certain now; this is that scurvy can be prevented by the use of orange juice or of potato water made from mashed potato mixed with the water in which potatoes are cooked, and by the use of fresh tomatoes or dried tomato pulp or raw cabbage.

3. *Growth-promoting substances*

Your daily food should contain two substances about which little is yet known. Both of these substances are necessary for health and growth. They are popularly called vitamines.

The first unknown substance, or vitamine, called fat-soluble A.— The foods that give you this unknown substance in the considerable amounts that you need are:

Milk	Eggs
Cream	Cheese made from whole milk
Butter	Cod-liver oil

Foods which will add this unknown substance to your diet but which are too bulky to be depended upon for all that you need are:

Leaves and stems of plants, such as:

Spinach	Swiss chard
Cabbage	Lettuce

This first unknown substance is often called the fat-soluble vitamine.

Children cannot grow or thrive without this substance, and they need more of it than does the adult.

Grown persons can secure a larger part of their supply from leaves and stems than can children, because they have a larger capacity for coarse food.

One of the greatest disadvantages in a child's diet poor in whole milk, is the possible lack of this vitamine.

The second unknown substance, or vitamine, called water-soluble B.—The foods that give you the second unknown substance in the considerable amounts that you need are:

Eggs	Breakfast foods and breads that include the outer layers of of the grain
Milk	
Dried peas, beans, lentils	

The foods that help to increase the amounts of this important substance in the dietary are:

Meat
Vegetables
Fruits

This second unknown substance that is necessary to health will not be lacking in a good mixed diet, particularly if whole cereal grains are used in breads and breakfast foods.

4. *Water*

One of the most important body-regulating foods is water.

It aids in digestion and absorption of foods and in the elimination of wastes.

It functions in circulation as a carrier for food and as a vehicle for waste materials.

Six or eight glasses of water should be the daily ration for each healthy adult.

5. *Other regulating substances*

Various other substances in foods act to regulate countless processes of the body that require regulation. If, however, right foods are chosen to meet the needs listed, the dietary will be a safe one and no further consideration need be given to the variety of foods required.

THE CORNELL READING COURSE FOR THE HOME

STATE EXTENSION SERVICE IN HOME ECONOMICS
THE NEW YORK STATE COLLEGE OF AGRICULTURE
AT CORNELL UNIVERSITY, ITHACA, NEW YORK
ALBERT R. MANN, DIRECTOR OF EXTENSION SERVICE
MARTHA VAN RENSSELAER, SUPERVISOR OF THE COURSE
BRISTOW ADAMS, EDITOR FOR THE COLLEGE

JUNE, 1919 THRIFT SERIES LESSON 129

QUESTIONS FOR GROUP DISCUSSIONS ON THRIFT

FLORA ROSE

Thrifty communities are made up of thrifty homes and thrifty individuals. All communities, and consequently all homes and individuals, are now summoned by the effects of the war to practice thrift. Thrift means careful and well-considered use of money and materials. Wise direction of effort and protection of health are requisites for thrifty living.

In a reading course lesson entitled *A Program of Thrift for New York State*, which is the basis of this series of lessons on thrift, suggestions for individual and group effort are outlined.

The questions here presented offer suggestions for discussion or debate by groups that can devote only fifteen or twenty minutes at each meeting to the subject of thrift. Programs for clubs are outlined in another lesson in this series, entitled *Club Programs on Thrift*.

I. Size and sources of the income

1. What bearing has a national debt on the value of the income?
2. In what ways can the effect of such a debt be counteracted by the individual?
3. What is the minimum income in your community that is sufficient to provide necessities and some comforts, and to make some provision for savings and the essentials of good citizenship:
   - a. For a single woman?
   - b. For a single man?
   - c. For a family of three persons — mother, father, and child?
   - d. For a family of five persons — mother, father, and three children?

4. What do you think an income should cover if it is to provide for wholesome development of a family or an individual?
5. How can persons who are not earning money contribute to the financial welfare of the family?
6. Should children contribute to the family income?
7. Does it pay to keep a cow? to keep chickens? to make a garden?
8. What members of the family can contribute to the savings?
9. Should the members of the family be consulted about investments?

II. **Earners and users of income**

1. What personal characteristics are assets to an income? What characteristics are liabilities?
2. What is the relation of good health to the size of the income?
3. Has the condition of health in your community any bearing on personal thrift?
4. Are you aiding in the support of families made dependent by preventable disease?
5. Will any advantages result from making the users of an income familiar with the sources of the income?
6. How would you estimate the financial value of the services that you render in your household?
7. Is the child in the city home more than a star boarder? Can he be made responsible to the home for some of his expense to the home?
8. Is the child in the country home a star boarder? Should the work of the country child be regulated?
9. Which is the more difficult problem, to earn an income of $100 a month or to dispense it wisely for a family group? In which case is training more necessary?
10. What should constitute the training in the home and in the school for the girl who is later to assume responsibilities involved in using a family income? How is this training being given to the girls in your community?
    a. By the home?
    b. By the school?
    c. By the community?
11. Should boys receive any training that will give them a better understanding of the use of the family income?
12. Can the value of property be increased thru good care?

III. The cash account

1. Are the results gained from keeping a cash account worth the time and effort required?
2. Compare the business of the average household with the business of some small commercial firm with which you are familiar:

    a. In importance.
    b. In trained supervision.
    c. In records.
    d. In annual statements.

3. What advantage would it be to the children in the family to help in keeping the household account?
4. Should children be required to keep account of their expenditures?
5. Should the farm woman keep a cash account, even tho much of the family living comes from the farm?
6. Is it of service to the farm family to know the cost of their living?

IV. The budget as a basis for using the income

1. If expenses are met without a budget or an account as a guide, what needs are most likely to be slighted?
2. How shall an allowance be made to the person directing household expenditures?
3. What shall constitute the basis of that allowance?
4. Shall the woman on the farm have a regular allowance for family expenditures, or an allotment of the year's profits? What constitutes a fair basis for this?
5. Shall the division of the family income be determined by:

    a. The husband?
    b. The wife?
    c. Conference between the husband and the wife?
    d. Family council?

6. Shall the children learn to take part in a family council that meets to divide the income?
7. Shall household bills be paid from a joint checking account established for that purpose?
8. Shall a portion of the income be allotted to the children in the family?
9. If the child is given an allowance, what items should the allowance cover?
10. Should the child finally be made responsible for all his purchases?

11. What are the standards of living in your group in respect to:

a. Food?	d. Health?
b. Shelter?	e. Education?
c. Clothing?	f. Recreation?

Are these standards developing a wholesome family life?

THE CORNELL READING COURSE FOR THE HOME

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BRISTOW ADAMS, EDITOR FOR THE COLLEGE

JUNE, 1919 THRIFT SERIES LESSON 130

CLUB PROGRAMS ON THRIFT

The character of any people is strengthened by the practice of thrift. To-day, war debts and the decreased value of the dollar are awaking the American people to an appreciation of thrift.

The programs here assembled are for the use of clubs which realize the present opportunity to crystallize into a national trait a characteristic that war conditions have forced upon many individuals.

DISCUSSIONS

The extent to which all members take part in a program determines in large measure its success. Discussion of topics is to be encouraged rather than the reading of papers. The topics suggested in the following programs may be assigned to different leaders for each meeting. The assignment should be made at the meeting preceding the one for which the discussion is scheduled. Each leader should have a committee to work with her.

Occasionally it may be desirable to invite public officials, lawyers, teachers, ministers, bankers, or physicians to speak at the meetings or to help on questions concerning which they are especially qualified to give advice.

GROUP SINGING

The work of recreational agencies during the war has shown the value of group singing. A club meeting that begins with singing in which everybody joins is likely to be a success. A local leader of music may give assistance until the club acquires the singing habit. All work and no play bores Jill. Music, games, exercises, and other forms of entertainment have an important part in a successful club program.

REFERENCES

The topics for discussion suggested in the following programs are based largely on a series of reading course lessons on thrift which are

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available from the New York State College of Agriculture. Other leaflets on thrift, prepared by the United States Department of Agriculture and the United States Treasury Department, can be obtained free of charge by writing to the Division of Publications, United States Department of Agriculture, Washington, D. C.

Many other references are available, and when it is possible to obtain them the committee can bring added interest to the discussions by using such sources of information. Local librarians will often be glad to add good books to their shelves on recommendation of their patrons. An excellent bibliography on thrift is printed in a bulletin called *Thrift*, published by the National Education Association in January, 1917.

Clubs adopting the thrift program are asked to send their lists of members and officers to the Department of Home Economics, New York State College of Agriculture, Ithaca, New York.

SUGGESTED PROGRAMS

PROGRAM 1

THRIFT AND THE AMERICAN PEOPLE

GROUP SINGING

ROLL CALL

"She is a thrifty person." When you say this, what do you mean?

DISCUSSIONS

Has the war taught us thrift?
How can thrift become a permanent characteristic of our people?
What is the value of thrift?
Why is its practice particularly important at this time?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 2, and lesson *Self-Study Outlines for Promoting Thrift.*

GROUP SINGING

REFERENCES

Self-study outlines for promoting thrift. Cornell Reading Course for the Home, Lesson 125.

Thrift. National Education Association, 1400 Massachusetts Avenue, N.W., Washington, D. C. 25 cents.

Is thrift worth while. Mr. American? U. S. Department of Agriculture and U. S. Treasury Department, Thrift Leaflet 1.

Keeping up with Lizzie. Irving Pacheller.

PROGRAM 2

SELF-STUDY FOR EARNERS

GROUP SINGING

ROLL CALL

Tell of some simple, practical thrift measure that you have found worth while.

DISCUSSION

Ways of adding to the money income.

Is it thrifty to keep chickens and a cow? to make a garden? to be the family seamstress, cook, and laundress?

Under what conditions may it not be thrifty to do this work?

Teaching the children thrift.

When shall it begin? How shall it be done?

Shall the children be encouraged to earn money?

The housewife as an earner.

What is the time of the housewife worth in keeping the house in order, preparing the food, and ministering to the needs of the family?

Is she supplementing the income to the amount that would be required to employ some one for this purpose?

If she does none of this work, what equivalent service is she under obligation to render?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 3, and lesson *Self-Study Outlines for Promoting Thrift.*

MUSIC

REFERENCES

Self-study outlines for promoting thrift. Cornell Reading Course for the Home, Lesson 125.

Thrift. National Education Association, 1400 Massachusetts Avenue, N.W., Washington, D. C. 25 cents.

PROGRAM 3

PROTECTION OF THE INCOME

GROUP SINGING

ROLL CALL

From your experience, what do you consider the safest way of protecting the income?

DISCUSSION

Storing up for old age.

How many earning years may be anticipated by the average person?

How can the later years of life be made financially independent thru a definite financial program during earning years?

In your community, what proportion of the average income would need to be saved annually to give a reasonable assurance of financial independence during the later years of life?

Ways in which the income of the family can be protected.

Insurance.

What kinds of insurance are there?

What should determine the amount of insurance taken?

Savings.

What is the value of a plan for systematic saving?

Can all the people in your community afford to save?

What is the minimum income in your community that will allow for saving?

Education.

To what extent do previous training of the wife, and training and education of the children, protect the income?

Do laws protecting the public health and necessitating the expenditure of public funds protect the income?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 4, and lesson *Self-Study Outlines for Promoting Thrift.*

MUSIC

REFERENCE

Self-study outlines for promoting thrift. Cornell Reading Course for the Home, Lesson 125.

PROGRAM 4

WORK AND SERVICE

MUSIC

ROLL CALL

In what way is the average housewife in your community an asset to the family income?

DISCUSSIONS

Work in the home.

To what extent can careful planning and the use of labor-saving devices reduce the time which must be spent in housework?

Should the work done by the housewife in the home, plus the service she renders to the community, be sufficient, if money were received, to support her?

Service in the community.

To what extent is community service an obligation of every individual?

To what extent will home obligations, health, finances, executive ability, leadership, citizenship, affect community service?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 5, and lesson *Self-Study Outlines for Promoting Thrift.*

GROUP SINGING

REFERENCE

Self-study outlines for promoting thrift. Cornell Reading Course for the Home, Lesson 125.

PROGRAM 5

USING THE INCOME

GROUP SINGING

ROLL CALL

What is one characteristic of a person who spends money wisely?

DISCUSSION

Which family is likely to fare better, the one with a large income carelessly spent, or the one with a smaller income used in a thrifty manner? Which is a greater asset to the State? Why?

How can children be taught the thrifty use of money, time, food, clothes, and health? Shall they keep expense accounts?

How do personal characteristics affect the use of the income?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and debate in Program 6, and lesson *Self-Study Outlines for Promoting Thrift.*

GROUP SINGING

REFERENCE

Self-study outlines for promoting thrift. Cornell Reading Course for the Home, Lesson 125.

PROGRAM 6

PROBLEMS OF BUYING

GROUP SINGING

ROLL CALL

Can saving be effected by cooperative buying of household supplies?

DEBATE

Resolved, That our prosperity depends on our supporting home stores, rather than buying in neighboring towns and by catalog. (Invite men as well as women to take part in this debate.)

ANNOUNCEMENT OF DECISION OF JUDGES

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 7, and lesson *Making a Budget.*

GROUP SINGING

REFERENCES

Cooperation: the hope of the consumer. Emerson P. Harris.

PROGRAM 7

SAVINGS AND INVESTMENTS

GROUP SINGING

ROLL CALL

What methods of saving have proved to be good, in your experience?

DISCUSSIONS

"Economy is not miserliness nor necessarily self-denial, but spending in the best way possible to bring returns." Discuss this statement to determine what proportion of the income should be reserved for savings.

Methods of saving.

- Insurance — accident, life, fire, health. Is it a good investment?
- Liberty bonds and War Savings Stamps.
- Savings banks.
- Other investments, such as real estate, stocks, and bonds.
- Safety and value of various kinds of insurance and investments. (The discussion may be led by a business man.)
- Is there any better investment than to support the Government in relieving the world's present needs?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 8, and lesson *Making a Budget.*

MUSIC

REFERENCE

Making a budget. Cornell Reading Course for the Home, Lesson 124.

PROGRAM 8

THE FAMILY BUDGET

MUSIC

ROLL CALL

What, in your opinion, is the most important reason for making a budget?

DISCUSSIONS

A budget for an income representative of that of the average family in the community. (A blackboard should be used, if possible.)

The Nation on a budget basis. What are the claims made by those who advocate and those who oppose the budget as a basis for the expenditures of the Government? Would it tend to result in a wiser division of funds? (The discussion may be led by a lawyer or a business man in the community.)

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 9, and lesson *How to Keep a Cash Account.*

GROUP SINGING

REFERENCES

Making a budget. Cornell Reading Course for the Home, Lesson 124.

The business of the household. C. W. Taber.

Marketing and housework manual. S. Agnes Donham.

Cost of food. Ellen H. Richards.

The household budget. John B. Leeds.

Household budget clubs. Teachers College, Columbia University, Technical Education Bulletin 39. 25 cents.

Seven steps toward saving. U. S. Department of Agriculture and U. S. Treasury Department, Thrift Leaflet 2.

PROGRAM 9

KEEPING A CASH ACCOUNT

GROUP SINGING

ROLL CALL

What advantages or difficulties are there in keeping an accurate record of cash receipts and expenditures?

DISCUSSION

Forms of keeping cash accounts. (The discussion should be led by a member of the club who is keeping accounts. A blackboard should be used, if possible.)

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 10, and lesson *Points in Selecting the Daily Food.*

MUSIC

REFERENCES

How to keep a cash account. Cornell Reading Course for the Home Lesson 126.

The business of the household. C. W. Taber.

The household budget. John B. Leeds.

Farm household accounts. U. S. Department of Agriculture, Farmers' Bulletin 964.

Household budget clubs. Teachers College, Columbia University, Technical Education Bulletin 39. 25 cents.

PROGRAM 10

THE DAILY FOOD

GROUP SINGING

ROLL CALL

How do you choose the day's food?

MUSIC, RECITATION, OR READING

DISCUSSIONS

Points that have been helpful to club members in selecting the daily meals.

What would be the advantages in adding to this knowledge?

Has the diet that has been followed any bearing on present health?

Are the children in the community receiving food that is right for health, growth, and development? If not, what might be done about it?

What are some of the indications of right and wrong feeding:

In the adult?

In the child?

How does the average dietary in the group measure up to the standard?

What general changes in the average diet would the group advocate?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 11, and lesson *Points in Selecting the Daily Food.*

GROUP SINGING

REFERENCES

Points in selecting the daily food. Cornell Reading Course for the Home, Lesson 128.

Short cuts for the home dietitian. Cornell Reading Course for the Farm Home, Lesson 112.
Feeding the family. Mary Swartz Rose.
The newer knowledge of nutrition. E. V. McCollum.
Food products. Henry C. Sherman.

PROGRAM 11

CONSUMPTION OF MILK, AND NATIONAL HEALTH

GROUP SINGING

ROLL CALL

The amount of milk used daily in your family and your neighborhood.

GROUP FOLK DANCE

DISCUSSIONS

Why is it important to individuals and to a community to secure an abundant supply of good milk?
Why is milk valuable for health, growth, and development?
What are the possibilities of keeping a satisfactory standard of health when milk is replaced with other foods?
What should be the minimum allowance of milk in the family diet?
What steps should be taken to increase the consumption of milk in the community?
In what other ways than as a beverage may milk be used?

APPOINTMENT OF COMMITTEE

To report at next meeting on plans for increasing the use of milk in the community.

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call, report, and discussion in Program 12, and lesson *What to Spend for Food.*

REFRESHMENTS

Cocoa and wafers.

REFERENCES

Points in selecting the daily food. Cornell Reading Course for the Home, Lesson 128.
The newer knowledge of nutrition. E. V. McCollum.
Feeding the family. Mary Swartz Rose.
Milk: a cheap food. Cornell Reading Course for the Farm Home, Lesson 111.
Answers to questions about milk. New York State Department of Farms and Markets, Division of Agriculture, Circular 185.

Ways of using milk. New York State Department of Farms and Markets, Division of Agriculture, Circular 184.

Milk, the indispensable food for children. U. S. Department of Labor, Children's Bureau, Publication 35.

PROGRAM 12

THE FOOD BUDGET — PART I

GROUP SINGING

ROLL CALL

How do you determine the amount of money to be spent for food?

GAMES BY GROUPS

REPORT OF COMMITTEE

Plans for increasing the use of milk in the community.

DISCUSSION

How much money must be spent for raw food materials in this community to buy adequate food for an adult and for a child?

For milk?
For vegetables and fruits?
For fats?
For sugars and sweets?
For meats and meat substitutes?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call, discussion, and debate in Program 13, and lesson *What to Spend for Food.*

MUSIC

REFERENCES

What to spend for food. Cornell Reading Course for the Home, Lesson 127.

Food products. Henry C. Sherman.

Feeding the family. Mary Swartz Rose.

The adequacy and economy of some city dietaries. H. C. Sherman and L. H. Gillett. New York Association for Improving the Condition of the Poor. 25 cents.

PROGRAM 13

THE FOOD BUDGET — PART II

GROUP SINGING

ROLL CALL

The proportion of the allowance for food that you spend for milk, vegetables and fruits, fats, sugars and other sweeteners, meats and meat substitutes.

GROUP EXERCISES

DISCUSSIONS

Is one-fifth of the money allowance for food a sufficient amount to supply the customary quantities of meat in the average family? Should it be?

Why is it desirable to include meat in the dietary? What are the effects on quality and healthfulness of the diet if all meat is excluded? What are the effects on the value of the dietary if an undue proportion of money is spent for meat?

What needed foods are the most likely to be neglected in your community?

DEBATE

Resolved, That the buying of food for the family should be governed by the needs and desires of the adults of the family, instead of those of the children.

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 14.

REFERENCES

What to spend for food. Cornell Reading Course for the Home, Lesson 127.

Food products. Henry C. Sherman.

Feeding the family. Mary Swartz Rose.

The adequacy and economy of some city dietaries. H. C. Sherman and L. H. Gillett. New York Association for Improving the Condition of the Poor. 25 cents.

PROGRAM 14

THE SELECTION OF CLOTHING

GROUP SINGING

ROLL CALL

State one reason why an inventory of the wardrobe is desirable.

DISCUSSIONS

How can you determine good material in buying silk, wool, cotton, or linen? Illustrate with samples of good and of poor quality.

Points in selecting ready-made garments, undergarments, dresses, suits, shoes, hats.

When is it economical, and when extravagant, to buy at a bargain counter or a sale?

Can the club members save money by buying certain materials in quantity from local dealers; for example, muslin, sheeting?

APPOINTMENT OF COMMITTEE

To report on the desirability of buying certain materials in quantity from local dealers.

ANNOUNCEMENT

Each member is asked to wear a made-over garment at the next meeting.

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 15.

MUSIC

REFERENCES

Hints on choosing textiles. Cornell Reading Course for the Farm Home, Lesson 45.

Clothing for the family. Federal Board for Vocational Education, Bulletin 23.

Some points in choosing textiles. Charlotte M. Gibbs. University of Illinois, Bulletin 50.

Wise spending saves. U. S. Department of Agriculture and U. S. Treasury Department, Thrift Leaflet 3.

Textiles. Paul H. Nystrom.

Textiles. Mary Schenck Woolman and Ellen Beers McGowan.

Clothing for women. Laura I. Baldt.

Dressmaking. Jane Fales.

PROGRAM 15

MADE-OVER GARMENTS

GROUP SINGING

ROLL CALL

Describe any success that you have had in remodeling a garment. Point out the economy. Exhibit the garment.

REPORT OF COMMITTEE

Desirability of buying certain materials in quantity from local dealers.

DISCUSSIONS

What should determine whether ready-made or homemade garments are more economical?

Do the club members as individuals or as a group have a definite plan for disposing of clothing that is valuable but no longer of use to the owners?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 16.

GROUP SINGING

REFERENCES

Clothing for the family. Federal Board for Vocational Education, Bulletin 23.

Clothing for women. Laura I. Baldt.

Dressmaking. Jane Fales.

Textiles. Paul H. Nystrom.

Textiles. Mary Schenck Woolman and Ellen Beers McGowan.

PROGRAM 16

EXERCISE IN RELATION TO HEALTH

GROUP SINGING

ROLL CALL

How much time do you spend in the open air daily, and what do you consider the benefits of time so spent?

DISCUSSIONS

Exercise and its benefits. (Led by a teacher of physical training, if possible.)

Daily Dozen Set-up, by Walter Camp, American Magazine, March, 1919.

APPOINTMENT OF COMMITTEE

To investigate prevalence of constipation. Consult physicians, doctors, druggists, nurses.

EXERCISES

Under the direction of a teacher of physical training, or according to the directions in *Daily Dozen Set-up*, by Walter Camp, in the American Magazine, March, 1919.

ASSIGNMENTS FOR NEXT MEETING

Topics for discussion in Program 17.

GROUP SINGING

REFERENCES

Saving strength. Cornell Reading Course for the Farm Home, Lesson 25.

Prevention of disease and care of the sick. Treasury Department, U. S. Public Health Service, Miscellaneous Publication 17.

Home and community hygiene. Jean Broadhurst.

PROGRAM 17

CONSTIPATION IN RELATION TO HEALTH

MUSIC

ROLL CALL

REPORT OF COMMITTEE

Prevalence of constipation.

EXERCISES

Demonstration of exercises to correct constipation. Practice by club members.

DISCUSSIONS

What are some of the results of constipation?

Ways of relieving constipation thru choice of foods and regulation of habits.

APPOINTMENT OF COMMITTEE

To investigate epidemics that have occurred in the community during the past five years, and the causes to which these are attributed.

GROUP SINGING

REFRESHMENTS

Apples and bran cookies.

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 18.

REFERENCES

Prevention of disease and care of the sick. Treasury Department, U. S. Public Health Service, Miscellaneous Publication 17.

Home and community hygiene. Jean Broadhurst.

PROGRAM 18

EPIDEMICS

GROUP SINGING

ROLL CALL

Suggestions for overcoming sleeplessness.

REPORT OF COMMITTEE

Epidemics that have occurred in the community during the past five years, and the causes to which these are attributed.

DISCUSSION

What steps have been taken or should be taken to prevent a recurrence of these or similar epidemics?

APPOINTMENT OF COMMITTEE

To investigate the prevalence of adenoids and diseased tonsils among the children of the community.

POSTURE EXERCISES

ASSIGNMENTS FOR NEXT MEETING

Topics for discussion in Program 19.

GROUP SINGING

REFERENCES

Prevention of disease and care of the sick. Treasury Department, U. S. Public Health Service, Miscellaneous Publication 17.

Home and community hygiene. Jean Broadhurst.

PROGRAM 19

ADENOIDS AND DISEASED TONSILS

GROUP SINGING

ROLL CALL

REPORT OF COMMITTEE

Prevalence of adenoids and diseased tonsils among the children of the community.

TALK

Symptoms and dangers of adenoids and diseased tonsils. (By a physician, if possible.)

DISCUSSION

What action shall be taken by the group to institute remedial measures?

FOLK DANCING OR EXERCISES

Under direction of the teacher of physical training or other leaders.

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 20.

REFERENCES

Home and community hygiene. Jean Broadhurst.

PROGRAM 20

THE CONVENIENT KITCHEN

GROUP SINGING

ROLL CALL

Name some feature that seems to you of conspicuous importance in the arrangement of the kitchen.

DISCUSSIONS

Relation of doors to the work done in a kitchen.

What is the minimum size desirable for a kitchen?

How and where should the windows be located?

How should the work in the kitchen be organized to save steps?

In what ways can the equipment and utensils be arranged for greatest convenience and ease in work?

In what respects is the appearance of the kitchen important?

In what simple ways can inconvenient kitchens sometimes be improved?

ASSIGNMENTS FOR NEXT MEETING

Topics for roll call and discussion in Program 21.

GROUP SINGING

REFERENCES

Planning the home kitchen. Cornell Reading Course for the Farm Home, Lesson 108.

The farmhouse. Cornell Reading Course for the Farm Home, Lesson 39.

The efficient kitchen. Georgia Boynton Child.

The new housekeeping. Christine Frederick.

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Country Milk Stations

Function, Organization, Operation, Construction, and Equipment

W. A. Stocking, W. E. Ayres, Roy C. Potts, and H. F. Meyer

A modern country milk station in New York State

Published and distributed in furtherance of the purposes provided for in the
Act of Congress of May 8, 1914

COUNTRY MILK STATIONS

FUNCTION, ORGANIZATION, OPERATION, CONSTRUCTION, AND EQUIPMENT

W. A. Stocking, W. E. Ayres, Roy C. Potts,[1] and H. F. Meyer[1]

The State of New York produces annually approximately 269,500,000 gallons of milk for market purposes. The city of New York alone requires approximately 75,000 ten-gallon cans of milk daily, or nearly 274,000,000 gallons annually. By far the greater part of this milk is produced in New York State and passes thru a country milk station before it is transported to the city market.

The increasing demand of the larger urban centers of population for an adequate milk supply has made necessary the establishment of country milk stations in rural districts located farther and farther from the large cities. This bulletin is published in response to a demand for information regarding the organization, operation, construction, and equipment of country milk stations by organizations of milk producers and by milk distributors. It has been prepared by the Department of Dairy Industry, of the New York State College of Agriculture, in cooperation with the Bureau of Markets, of the United States Department of Agriculture.

FUNCTION OF COUNTRY MILK STATIONS

The primary function of a milk station is to serve as a place where milk may be received and either prepared for shipment to market or manufactured into milk products. The business operations of milk stations are largely determined by the character of their equipment and the available market for milk or milk products. From the standpoint of business operations, milk stations may be classified as (1) those that function as milk receiving, cooling, canning, and shipping stations; (2) those with additional equipment for separating the cream and manufacturing cheese from the skimmilk; (3) those equipped to pasteurize and bottle milk and that perform either the former or both of these operations; (4) those equipped to manufacture milk products, such as butter, cheese, condensed milk, casein, milk sugar, and milk powder.

OWNERSHIP OF MILK STATIONS

The use to be made of milk delivered at a milk station depends largely on the ownership of the station. Most of the country milk stations in

[1] Representative of the Bureau of Markets, United States Department of Agriculture.

New York State from which milk is shipped to New York City are owned by the metropolitan milk dealers; therefore the producers are dependent on the dealers to provide the market outlets for their milk supply. The producers have also depended on the dealers to establish the market price for milk, for in general the milk producer has not had any market outlet for his milk except the country milk station, which the dealer owned and controlled.

Formerly the country stations functioned as creameries and cheese factories and were in many cases owned by the farmers, but as the demands of cities for market milk have increased, they have been bought by milk dealers and converted into milk shipping stations. Where the cooperative spirit of the farmers has not been maintained, the stock has been taken up by outside or private interests.

In many sections two or more milk stations have been established at or near the same shipping station, resulting in duplication of investment in buildings and equipment. This duplication of milk stations, resulting in higher costs and the control of the farmers' supply of milk by the dealer, is of sufficient practical importance to milk producers to warrant careful consideration.

ORGANIZATION OF COOPERATIVE MILK STATIONS

Preliminary to the organization of a cooperative milk station, a survey of the local conditions should be made. This survey should include the names of the prospective patrons of the station, the amount of milk each will supply, available market outlets for the milk or the products manufactured, desirable locations for the station, and the probable cost of the building and the equipment.

The first step in the organization of a country station should be the consideration of the advantages and disadvantages of the various forms of organization in order that the type best suited to the local conditions may be adopted. It has been found that unless the patrons are bound together by a strong cooperative spirit and pledge a definite quantity or all the milk they produce, the organization rests upon a very insecure foundation and may not succeed. This spirit and action is fundamental to the success of a cooperative marketing organization. To strengthen the bond among the members, to insure an adequate supply of milk, and to provide the finances necessary for conducting the business, it is desirable when ascertaining the cooperation and support that may be obtained from each producer to employ a form of preliminary agreement, such as is given on page 17.

If the results of this canvass for membership indicate that it is desirable to form an organization, a general meeting should be called for that

purpose by the leaders of the movement. All who have signed the preliminary organization agreement as well as others who may be interested should be invited to attend. An effort should be made to gain the cooperation of still other milk producers. A temporary chairman and secretary should be selected. An organization committee should be appointed to prepare articles of incorporation in accordance with the provisions contained in the preliminary agreement and to file them with the Secretary of State of New York State, after they have been adopted. This committee may also be instructed to draft a constitution and by-laws, which will later be brought before the association for approval. In drafting these articles and by-laws, it is well to obtain the assistance of some one versed in legal phases of cooperative organizations and to be guided by the by-laws of a successful organization of similar type. As the by-laws of one of the country milk and cream stations owned by a milk producers' organization in New York State have been copied by a number of other milk stations in the State, they are given on pages 18 to 22 in essentially their original form.

Altho New York has had a cooperative law[2] for several years, but few organizations have been formed in accordance with its provisions. The usual plan has been to form a regular stock company corporation and to draw the by-laws so as to enable it to operate on a cooperative plan.

In many respects it would be more desirable for cooperative milk stations to be organized under a cooperative law rather than under the corporation law, especially when it is desired to form a non-stock cooperative organization, instituted for mutual help, not for profit, and composed entirely of actual farmers. Suggestions for a cooperative law designed to provide for the incorporation of cooperative organizations are contained in *Service and Regulatory Announcements, No. 20*, issued in 1917 by the Bureau of Markets of the United States Department of Agriculture. By-laws for an organization incorporated under such a cooperative law may be obtained from that bureau upon request.

OPERATION OF COUNTRY MILK STATIONS

The milk stations in New York State that are owned by the milk dealers are also operated by them. Most of those owned by private interests or by stock companies that are used as milk shipping stations, are leased and operated by the milk dealers. Only a very few of the stations owned by cooperative associations are actually operated by them.

The management of the business of stock company and cooperative associations is usually entrusted to the board of directors, which is authorized to employ a competent manager and other needed help.

[2] Chapter 454 of the General Laws of 1913, entitled "An act to amend the business corporation law, in relation to cooperative corporations."

The extent of the business operations of a country milk station depends in large measure on the character of the business done and the market obtained for the various products. When bottled pasteurized milk is produced and the surplus is converted into manufactured milk products, the equipment and the business done must be much more extensive than when the milk is merely received, cooled, and shipped. The tendency to increase the amount of milk pasteurized and bottled at country stations rather than in city plants indicates that it may be more desirable or economical to perform these operations in the country. The pasteurization and preparation of Grade A milk in the country for distribution in accordance with the city milk regulations is also worthy of consideration.

Obviously the operation of a country milk station requires competent supervision of the business affairs as well as of the sanitary handling of the products. In case a number of stations are operated by one dealer, it is possible to standardize the business and sanitary methods much better than in independently operated stations. The operation of independent stations is confronted with problems that require expert skill in their solution. If the required skill cannot be obtained, it is often better to lease the station to a milk dealer than to operate it independently.

LEASING OF COOPERATIVE MILK STATIONS

A survey made during the past year of the cooperative milk stations of New York State showed that at some stations the farmers owned the building and the dealer furnished the necessary machinery and equipment. This arrangement did not appear to be very satisfactory for either the farmers or the dealer. In most instances the dealers held a long-term lease; therefore the producers were unable to avail themselves of offers from other dealers, for the local facility was controlled by the lessee. Since the dealers had leased the stations, they often did not feel justified in making the expenditures for repairs or equipment that would have been made if they had owned them. Very often the rental was inadequate to maintain the building in good condition.

At other stations, the farmers owned both the building and the equipment and leased the entire plant to the milk dealer. Under such an arrangement, the dealer is not financially interested in the building or the equipment; therefore the lease should be so drawn that the dealer assumes the responsibility for the maintenance, repair, and proper care of both building and equipment. The consideration of a proper rental charge should be separate and apart from the price received for the milk. Unless otherwise provided, the rental charge should be adequate to defray the taxes, insurance, depreciation of building and equipment, and reasonable interest on the amount invested or the present appraised value of

the station complete with land, building, and equipment. In case the dealer leases the station and furnishes all or a part of the equipment and the station is operated by the local association, compensation for handling the milk is usually based on a charge per can or per hundred pounds of milk handled.

A form of lease such as is given on page 23 may be helpful to organizations that desire to lease their stations.

CONSTRUCTION OF MILK STATIONS

In the construction of milk stations much depends on the local conditions. The location of the station, the plans of the building, and the material to use in its construction are matters that must be determined separately for each community. There are certain conditions that must be considered in the construction of every station, and these are here discussed in a general way. Some floor plans are given in this bulletin (figs. 1 to 9), and the Department of Dairy Industry, of the New York State College of Agriculture, will furnish on request blue prints of floor plans for country milk stations and give such further information and assistance as it is able.

BUILDING SITE

Whenever possible the milk station should be located so that the product can be loaded directly into cars for shipping, and the empty cans, cases, or bottles, and supplies conveniently unloaded. Such a location is more economical and insures a better product, as hauling expenses and rises in temperature incident to the transportation and holding of the product on the station platform in warm weather are avoided. In general, a prominent location easily accessible for the delivery of milk by the patrons, is desirable. The more prominent and attractive the location, the greater is its value from an advertising standpoint.

WATER SUPPLY

A large quantity of water is required in country milk stations for washing and cooling purposes. Village water supplies are generally unsatisfactory, being expensive and usually too warm in summer, when the water is most needed as a cooling medium. If a sufficient quantity of flowing spring water is available, this is the most desirable source of supply, as it is generally cold and does away with the trouble and expense of pumping. Satisfactory assurance should be had that it will be sufficient in the summer months, when the milk supply is generally at its maximum and the water supply at its minimum. A long pipe line from the source of supply should be avoided, because of the tendency of the water to rise in temperature. A good drilled well is second in desirability, and a plenti-

ful supply of water of low and fairly constant temperature can often be obtained in this way. The well should be drilled on the site before the building is erected, and should be so located, if possible, that the pump will be in the boiler room for convenience and for protection from frost. A small trapdoor should be located in the ceiling or the roof directly over the well, in order to permit the removal of the tubing from the well if repairs become necessary.

Water supply tanks should be placed in the second story and protected from dust and heat and from freezing temperatures.

DRAINAGE

Connection to a good sewer system is one of the best means of sewage disposal. If no sewer connection is available, and it is necessary to empty the sewage into any body of water from which a village or a city water supply is drawn, the matter should be adjusted with the State Department of Health at Albany, thus obviating possible later difficulties. It is illegal to run large amounts of sewage into game streams in New York State, and if this form of disposal is contemplated the State Conservation Commission should be consulted. Drainage pits or cesspools are not satisfactory for a long period unless the soil is very porous, and in this case the water supply is likely to become contaminated unless the pit is located at a considerable distance from it. Septic tanks have seldom proved satisfactory when a large volume of liquid passed thru them. The use of a separate sewer connection below the septic tank thru which the water not containing putrefactive matter may be passed, is permissible and advisable.

MATERIAL

In deciding on the kind of material to be used in the construction of milk stations, durability and cost should be considered. In New York State wooden frame buildings are most numerous.

Some of those recently constructed are of brick, hollow tile, concrete blocks, or solid concrete. Buildings of these materials are preferable to wooden buildings for the following reasons: They are more durable, they are fireproof, they are cooler in summer and warmer in winter, and the cost of repair and upkeep is less. Hollow-tile construction finished on the inside with smooth cement and on the outside with stucco, makes a well-insulated and desirable wall at reasonable cost. Roofing material should be fireproof. Good asbestos constructions have proved very satisfactory. Slate and tile roofs also give good service. Altho metal roofing is fireproof, it heats the building more in warm weather than do some other materials.

SIZE OF BUILDING

The size of the building for a milk station depends on the quantity of milk to be handled and the extent of the operations required in the preparation of the milk for market. With the constantly increasing demand for pasteurized milk by cities, it is desirable to have a building of sufficient size so that the various operations of receiving, pasteurizing, cooling, and bottling the milk may be carried on. It may also be deemed advisable to install equipment for the manufacture of the surplus milk into products, such as butter, cheese, or condensed milk. In some instances it may be desirable to equip a station at an advantageous concentrating point so that the surplus milk from other stations may be converted economically and readily into the most profitable milk product.

In the construction of cheese factories and creameries, their future use as milk processing and shipping stations should be considered, so that the site selected and the arrangement of the building will be adapted for use as a milk station.

FOUNDATION

Foundations should be carefully laid by a competent mason and should have good broad footings located well below the frost line. A properly built foundation insures against settling and consequent cracking of walls. The depth varies from four to six feet or more, according to local soil conditions and the size of the building. The north and west sides should generally be deepest as they are more exposed to frost.

FLOOR PLANS

The floor plan of a milk station should provide for separate rooms in order that the greatest economy and most sanitary conditions may be realized. The boiler room should be of fireproof construction and separated from the other rooms, tho readily accessible from either the can-washing room or the processing rooms, particularly the former, as the man in charge of it is generally the one who can most conveniently look after the boiler during rush hours in case a regular fireman is not employed. A good-sized coal room should be conveniently near the boiler room.

Boards of health in some cities require that the handling of milk be done in a room separate from other manufacturing operations, and if milk is run over an open cooler, the cooler must be in a separate closed room. The requirements of the market to which the product will be sent should be ascertained before the final plans are completed.

The receiving room should be separate from the pasteurizing, cooling, and bottling room. It should be connected directly with the can-washing room, and provision should be made for the empty cans to pass over a

draining rack in their journey from the receiving can to the washer. Facilities should be provided for quickly washing, steaming, and drying the cans before their return to the patrons.

As samples for testing are taken in the receiving room, the testing room may be connected directly with it for convenience, or the testing room may be located in the second story, away from the confusion of other work. Testing apparatus should always be in a separate room, which is well lighted, warm and dry, and free from vibration. It is convenient sometimes to locate the office in the second story adjacent to the testing room.

The pasteurizing, bottling, and manufacturing rooms should be of ample size to permit the machinery to be properly located and used with the greatest economy, tho the occupying of unnecessary floor space should be avoided. Milk pipe-lines should be as short as possible and permit of easy cleaning. If the floor plan is such that the milk has to be pumped, the machinery should be so arranged that no pumping will take place after the milk is heated. In case pumps are necessary, the simplest and most easily cleanable type should be chosen. They should be so constructed that the milk will pass thru them easily, without churning, and of ample size to permit their operation at a normal speed. Pumps may be mounted on brackets against the wall or attached to the vats from which they draw, as small pieces of apparatus on the floor greatly interfere with cleaning. They should be so placed that the milk will flow to them by gravity.

If a refrigerator is included in the equipment, it should be located in the northeast corner of the building if possible. The rays of the sun reach that corner only in the early morning, and less refrigeration will be necessary than if this apparatus is placed in a more exposed position.

A separate room for supplies is customarily located in the second story, as this is usually drier than the first story. The supply room should be connected with the workrooms by a small elevator or a wide stairway or both.

The bathroom with usual toilet facilities and lockers, where the employees may keep their dairy and street suits, may be located on either the first or the second floor.

FLOOR CONSTRUCTION

Careful attention should be given to the laying of cement floors in creameries and milk stations; otherwise insecure foundations may be used and floors put down that will not be strong enough for the service they must render.

A settled foundation for the floor is essential. If a dirt fill is made, it should be thoroly tamped and afterward well settled by flooding with water. This should be done several times at intervals until the earth is thoroly settled. Another method is to fill in with stones, covering them with a layer of cinders and gravel or either of these alone. Such a filling should be well tamped. Any one of the last-mentioned methods affords good underdrainage.

All drainpipes should be in place before the floors are laid. It is well to embed them in the earth or the filler rather than to weaken the floor structure by enclosing them in the concrete. Drainpipes should be of good glazed tile with joints cemented. Branches flowing into the main drain should come from the refrigerator, the boiler and engine room, the receiving room, wash sinks, and the cooling apparatus. The advantages from this arrangement will much more than offset the slight expense and trouble of installation. Three-inch tile should be satisfactory for the branch leads, but the six-inch or the eight-inch size is not too large for the main drain. The drain should have sufficient fall so that it will quickly empty itself.

Traps should be installed and rigidly blocked in place before the floor is laid. They should be set slightly below the floor level to allow for the gradual wearing away of the surrounding floor. Good bell traps are the most satisfactory, as other types of traps are inclined to fill with refuse. Bell traps are easily cleaned from above and form an effective seal against the return of gas from the sewer system. They should be of ample size and preferably of brass, as iron traps are soon affected by creamery conditions.

Cement floors[3] are best laid by the two-course system, in which a first and thicker course made up of rather coarse material is covered by a thin coat of finer mixture, to form the wearing surface.

The proportions of sand, gravel, and cement will vary considerably with individual lots. Generally a mixture containing, by measure, one part Portland cement, two and one-half parts clean sharp sand, not too fine, and five parts mixed gravel or crushed stone varying in size from one-fourth to one and one-half inches, will make a good base. The materials should be as free as possible from organic matter and earth. The dry cement and sand should be mixed thoroly, then enough water added to make a stiff pasty mixture. The crushed stone or the gravel should then be drenched thoroly with water to displace the adhering air and to prevent drawing out from the cement the water needed to maintain

[3] Much valuable information concerning concrete construction is given in *The Use of Concrete on the Farm*, Farmers' Bulletin 461, which may be obtained from the Division of Publications, United States Department of Agriculture, Washington, D. C., and in the extension publications of the Portland Cement Association, 111 West Washington Street, Chicago, Illinois.

its consistency and to assist in the setting. The rock or the gravel should then be added to the mixture of cement and sand, and the entire mass thoroly mixed and used at once. This first layer should be at least four inches thick and should be well tamped as it is put in, until the fine cement shows as a layer on the surface. This packs the material solidly together and makes it much stronger when set.

The work of laying a floor should be carefully planned so that the surface course may be put on immediately after the base is laid. Ordinarily not more than forty-five minutes should elapse between the time the base is placed and the surface course is applied. This may be accomplished if the floor is laid out in blocks approximately ten feet square and the work on each block completed as rapidly as possible. The surface course should consist, by measure, of one part Portland cement and two parts clean sharp sand, not too fine. The dry cement and sand should be mixed together thoroly and enough water added to bring the mixture to a stiff pasty consistency. This course should be applied to the fresh concrete base before the latter has noticeably hardened. The surface may be settled by tamping lightly, and it can be brought at once to the proper grade with the strike board. The surface course should be about one inch thick when completed. Each block of the floor should be laid as an independent section and so framed that there will be a straight clean-cut joint between it and the next. Spaces may be closed with a one-to-two mixture, or filled with asphalt. In case the cement floor is to have severe use, as when milk cans are handled over it in the receiving room, it may be protected by embedding a perforated sheet of boiler iron in the surface. Specially designed castings are also being marketed for this purpose and are apparently highly satisfactory.

The floor should slope from one-fourth to one-half inch to the foot so that drainage will be rapid. Forms should be so constructed that the strike board may follow the top of the form, thus producing a uniform grade from wall to drain. After striking off the surface it should be thoroly worked down and compacted with a wooden float to make a smooth surface. Edges and corners should be rounded.

After the surface has set slightly, it should be covered with a couple of inches of sawdust. This covering should be left on for several days and sprinkled with water daily, so as to prevent rapid drying of the surface and checking.

HEATING

As heat always tends to rise, there is no better place for the heating system than in the floor itself. The heating pipes should start near the wall and pass several times around the room, working toward the center so that the condensed steam may be discharged into the drain

below the trap. Pipes should be two inches or more in diameter so that the exhaust steam from the engine and the tester can be used without causing undue back pressure. Used pipe is entirely satisfactory for this work and is much cheaper. All heating pipes should be in place on the floor foundation and rigidly fastened before the first concrete is put in. The pipes may be laid in a tile in the floor or embedded directly in the concrete. In the latter case they should first be coated with heavy grease, so that the concrete will not adhere to them when the floor sets; this would interfere with the expansion and contraction of the metal due to changes in temperature. If provision of this kind is not made, the floor will probably be cracked later. In case pipes are laid in tile, elbows of the same size as the pipe may be used, as the space in the elbows allows sufficient room for the lengthening of the pipe on heating. If the pipes are enclosed directly in the cement, larger elbows must be used or they must be made from sheet metal, so that the expanding pipe will be free to move in the elbow. Galvanized conductor pipe elbows may be used. While the floor method of heating is not so quick as some others, it is economical and holds the room temperature during the night.

If ordinary steam radiators are used, they should be placed as near the floor as possible. Sufficient radiating surface should be provided so that the rooms can be heated easily with a low steam pressure. The receiving room, tho generally unheated, should have a large radiator. Ample heating equipment tends to make a milk station a pleasant place in which to work.

LIGHTING

As light, especially sunlight, is a strong germicide, no effort nor expense should be spared in providing as much window space as possible. Particularly is it desirable that those rooms which are likely to be damp be well lighted. Ample light also tends to promote cleanliness in a station.

VENTILATION

Proper ventilation in a milk station is important, from the standpoint not only of the health of the employees but also of the sanitary condition of the product handled. The interior of the building should be kept dry and free from mold and odors. Various methods of ventilation are employed, such as the rotary fan system, ventilating shafts, and ventilating flues in the ceiling and the roof.

The flue system, installed on the same general plan as in dairy barns, is not expensive and is efficient. The outlet flues should start near the floor, should be well insulated, and should extend up well above the peak of the roof in order to insure a good draft. Well-made galvanized iron ventilator heads may be obtained ready-made and will increase the

draft. Registers or slides, placed in the flues near the floor and at the ceiling, permit the removal of damp air or steam as circumstances require. In summer it is then possible to draw from above and thus remove the heated air, while in winter the heated air can be partly retained by drawing thru the lower opening.

Fresh-air inlets are equally necessary. These are best provided by constructing within the side walls well-insulated vertical flues from just above the sill to within a few inches of the ceiling. These flues have openings at the lower ends for the admission of outside air and openings at the upper ends for the discharge of this fresh air into the room.

In such a system the outlet flues act as chimneys. As they draw the damp, stale air from the room, it is replaced by fresh air, which enters thru the inlet flues. Since this air is admitted near the ceiling and mixes with the warmer air already in the room, cold drafts are prevented and floors are much warmer than if the air were admitted thru a door or a window. During a part of the working day such a system may not be necessary, as doors are opened and closed often, admitting fresh air, but there are periods when it is essential to the proper ventilation of the rooms.

EQUIPMENT OF MILK STATIONS

The equipment of milk stations depends on the amount and the character of the business operations. In most of the cooperative stations in New York State, the milk is received, pasteurized, cooled to about 40° F., and canned for shipment to market. The equipment of a station may be classified according to its use as follows: receiving, processing, refrigerating, bottling, manufacturing, and power. The principal equipment necessary for various types of milk stations is given on pages 25 to 33. Before purchases are made, it would be well to submit lists of the style and size of equipment desired to dairy supply houses for competitive bids.

RECEIVING EQUIPMENT

The receiving room should be provided with a good set of scales, either automatic or of the multi-beam type, a receiving can of sufficient capacity, a complete set of sample jars with ground glass stoppers and contained in portable racks that can be placed in the refrigerator in warm weather when not in use, also convenient acid and sediment tests, and a milk sheet rack. The scales and the receiving can should be set on a level cement foundation far enough below the level of the receiving room floor so that the cans may be dumped easily. A bulletin board for posting information regarding feed, farm machinery, and stock for sale, the sale or the exchange of farm lands, notices of meetings, reports of butterfat, bacteria, and sediment tests, and the like, is useful.

PROCESSING EQUIPMENT

Since the processing machinery varies greatly according to the nature of the work in the individual plant, no attempt is made to discuss it here. Various makes of machines for each branch of the work are on the market. Some of these are cheaper tho not necessarily more desirable than others that may be more efficient and durable.

REFRIGERATING EQUIPMENT

Refrigeration in a milk plant is necessary in order to cool the milk after pasteurizing or before shipment, also for the icing of bottled milk in transit. At most stations in New York State, natural ice is used, altho some of the larger and more recently built plants have installed mechanical refrigerating equipment. Where natural ice is used, the interest, taxes, repairs, and depreciation on the ice house, also the labor and expense of putting up ice and getting it out for use, are considerable. Mechanical refrigeration is more convenient and sanitary, requires less labor, and the milk may be cooled quicker and to a lower temperature. In case two hundred and fifty or more cans of milk are handled daily, mechanical refrigeration is believed to be more economical than the use of natural ice. In calculating the cost of installing a mechanical refrigeration system, the figures should include the price of compressor, condenser, brine tank and pipes, expansion pipes, insulation, and the power required.

BOTTLING AND MANUFACTURING EQUIPMENT

What has already been said relative to processing equipment applies equally to bottling and manufacturing apparatus. There is such a variety of machines, each peculiarly fitted for a certain type or volume of work, that a discussion of their merits here would be of little value. The selection of apparatus for each of these lines of work rests entirely with the individual, who should purchase according to his local conditions and give due consideration to the labor required to operate the apparatus and its durability.

POWER EQUIPMENT

Steam power is used in most milk plants, as a boiler must be installed to furnish steam for pasteurizing, for heating water, and for steaming or sterilizing the utensils. A boiler should be of sufficient size to furnish the necessary supply of steam without forcing the fire. In order to give best results, it should also be set properly and well bricked in.

Generally a steam engine furnishes the power. In case electric current may be obtained at a reasonable rate, it is often economical to operate the machinery with separate small motors. When this is done, a smaller

boiler may be used. In some of the larger plants, both steam and electric power are developed. This is desirable where mechanical refrigeration is used, as electric motors are especially adapted to the operation of the ice machines.

THE MILK STATION GROUNDS

The grounds surrounding milk plants are generally given very little attention. As the outside of the station is always seen first by the visitor, the exterior of the building and the grounds surrounding it should not be neglected. Well-crowned graveled driveways, closely mown grass, and a few shrubs will go far toward giving an impression of prosperous conditions.

COST OF OPERATING A MILK STATION

The cost of operating a country milk station depends on the function it performs. The unit cost of operating a milk station that receives, cools, and cans milk is obviously much less than one in which pasteurization and bottling are done. The expense per unit of product handled is larger usually in stations handling small amounts. Within certain limits, wages, interest, insurance, and the like remain practically the same regardless of the volume of business. Consequently these fixed costs are greater per hundred pounds of milk handled where the business is small. Conversely, a large volume of business tends to reduce the cost of handling.

COST OF BUILDING AND EQUIPPING A COUNTRY MILK STATION

The cost of a country milk station depends on the cost of the land, the cost of the building, including ice house, and the cost of the equipment. These costs vary, of course, in different communities according to local conditions and the type of station constructed. For this reason figures given here would be of little value. The building site may be donated to the organization, or it may cost several hundred or thousand dollars. The cost of the building including water supply and sewage disposal facilities depends on size of building, kind and cost of material used, and labor costs in the community.

With information at hand in regard to the type, the size, and the general plans of construction, estimates may be obtained from local contractors and builders. Similar action may be taken in obtaining estimates from dairy supply houses of the cost of the required equipment. In getting costs and determining on the plans of the building and the list of equipment, assistance may be obtained from the Department of Dairy Industry of the New York State College of Agriculture.

SUGGESTED FORM FOR PRELIMINARY ORGANIZATION AGREEMENT

We, the undersigned, do hereby agree to associate ourselves together and to pay for the number of shares set opposite our respective names of the capital stock of the corporation to be organized under the laws of the State of New York with a capital stock of ($..........) ....dollars, which is divided into non-assessable shares of $.......... each, said shares to be taken and paid for as the board of directors of the corporation may require.

The object and purpose of the corporation shall be to secure better results in the handling, selling, and disposing of the milk produced by the subscribers; to rent, lease, buy, build, own, sell, and control such buildings or other real estate and personal property as may be needed in the business; to buy farm supplies in a cooperative way; to encourage better and more economical methods of production; to cultivate and develop the cooperative spirit in the community and to perform any other work that may tend to the betterment of the members and the improvement of rural conditions.

We further agree that the milk or the cream to be delivered shall be produced in accordance with the regulations governing the production and handling of dairy products in the State, and in accordance with the rules and regulations of the board of health of the particular city for which these products may be destined, and in accordance with the rules prescribed by the board of directors of the corporation.

It is further agreed that all the milk produced by the herds of the undersigned subscribers shall be delivered and sold thru the corporation, except such quantities as may be necessary for household or stock-raising purposes.

As it would be extremely difficult to ascertain the amount of the damage sustained by the corporation upon failure of the subscriber to deliver such milk, it is therefore further agreed that the corporation shall be entitled to liquidated and agreed minimum damages to the sum of thirty cents for each one hundred pounds of pledged milk not delivered, said sum to be deducted from the subscriber's money or charged against his notes in the possession of the corporation.

As it is not the intention of the subscribers to conduct the business of the corporation for profit, it is agreed that after the season's expenses are paid and a proper sum set aside as a reserve for depreciation of the corporation's property, for a necessary contingent fund, and for the payment of 5-per-cent dividends on the distributed stock, the balance of any remaining funds shall be divided among the patrons of the corporation in proportion to the quantity and the quality of the milk marketed by each thru the corporation.

Date	Name of subscriber	Number of cows
....	....	....
....	....	....
....	....	....

BY-LAWS OF A COUNTRY MILK STATION[4]

ARTICLE I. MEETINGS OF STOCKHOLDERS

Section 1. The annual meeting of the stockholders for the election of directors and for such other business as may properly come before the meeting, shall be held at the office of the company in the village of ...., County of......................, and State of New York, on the first Monday of January of each year, except when said first Monday falls on the first day of January, then said meeting shall be held on the second Monday of January at one o'clock in the afternoon of said day or days.

The secretary shall serve personally, or send thru the post office at least ten days before such meeting, a notice thereof, addressed to each stockholder at his post office address as the same appears on the books of the company. Notice of the time and place of holding the annual meeting and election shall also be given by publication thereof at least once in each week for two successive weeks immediately preceding such election, in a newspaper published in....................County.

Section 2. Special meetings of stockholders, other than those regulated by statute, may be called at any time by a majority of the directors upon ten days' notice to each stockholder, such notice to contain a statement of the business to be transacted at such meeting, and be served personally or sent through the post office addressed to each stockholder of record at his post office address, as the same appears upon the books of the company.

The board of directors shall also in like manner call a special meeting of the stockholders whenever so requested in writing by stockholders representing not less than one-third of the capital stock of the company.

No business other than that specified in the call for the meeting shall be transacted at any special meeting of the stockholders.

Section 3. Voting. At all meetings of stockholders and at all elections of directors, each stockholder in person or by proxy shall be entitled to cast one vote for each share of stock standing in his or her name on the transfer books of the company at least ten days preceding the meeting.[5] All proxies shall be in writing and shall be filed with the secretary at or previous to the time of meeting.

Section 4. Order of business. At all meetings of stockholders the following order of business shall be observed so far as consistent with the business of the meeting:

a. Reading minutes of preceding meeting, and action thereon.
b. Report of president.
c. Report of secretary.

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[4] The Holland Patent Milk and Cream Company, Holland Patent, New York.

[5] If each stockholder is also a patron, it is quite possible that the allowing of one vote for each share of stock would be a satisfactory system, tho it is equally possible that the owner of a very small herd might hold a large number of shares of stock and thus have the power to outvote his neighbor who had a large herd but who held a smaller amount of stock. In this way he could defeat the wish of the larger producer regarding the disposal of his product. There are few, if any, mutual associations of this type in New York State. It is probable that nearly all of the so-called cooperative companies in the State are joint stock companies having cooperative features incorporated in their by-laws. In an organization of this kind, where a considerable amount of the stock may be held by persons not patrons of the plant, each stockholder preferably should be entitled to but one vote.

d. Report of treasurer.
e. Report of committees, if any.
f. Election of directors.
g. Unfinished business.

ARTICLE II. DIRECTORS

Section 1. Number. The general management of the business of the company shall be exercised by a board of seven directors, who shall be respectively stockholders of record, and at least two of such directors shall be residents of the State of New York.

Section 2. How elected. At the annual meeting or other election, the seven persons receiving a plurality of the votes cast at the election held thereat, shall be directors for the ensuing year.

Section 3. Term of office. The term of office of each of the directors shall be one year and thereafter until a successor be elected.

Section 4. Duties of the director. The board of directors shall have the control and general management of the affairs and business of the company. Such directors shall act as a board by a majority thereof, and they may adopt such rules and regulations for the conduct of the business as they may deem proper, not inconsistent with these by-laws and the laws of the State of New York.

Section 5. Directors' meetings. Regular meetings of the board of directors shall be held on the first Saturday of each month at two p. m. Special meetings of the board of directors may be called by the president. Special meetings must be called by the president or the treasurer, or the secretary upon the written request of two directors. Notice of a special meeting of the board of directors shall be served on each director in person at least twenty-four hours before the meeting, or mailed to him at his post office address as it appears upon the books of the company at least two days prior to the time of the meeting. A meeting of the board of directors can also be held at any time without notice when all the board is present.

At any meeting of the board of directors, four directors shall constitute a quorum for the transaction of business. In the event of a quorum not being present, a less number may adjourn the meeting to some future time, not more than seven days later.

At all meetings of the board of directors, each director is to have one vote irrespective of the number of shares of stock of this company that he may hold.

Section 6. Vacancies. If any director shall cease to be a stockholder of record, or shall by ceasing to be a resident of the State fail to be qualified as a director, then or in all of such cases his place among the directors shall thereby become vacant.

Whenever any vacancy shall occur in the board of directors by death, resignation, or otherwise, the same shall be filled without undue delay by a majority vote by ballot of the remaining members of the board at a special meeting that may be called for that purpose, or at any regular meeting. The person so chosen to fill a vacancy shall hold office until his successor is elected at the annual or a special meeting of the stockholders called for that purpose.

Section 7. Removal of directors. Any one or more of the directors may be removed, either with or without cause, at any time by a vote of the stockholders holding two-thirds of the stock at any special meeting called for that purpose.

ARTICLE III. OFFICERS

Section 1. Number of officers. The officers of the company shall be a president, a vice president, a treasurer, and a secretary. They shall be chosen from the board of directors and hold their office during the pleasure of the board, or until the next annual meeting.

Section 2. Election of officers. The officers of the company shall be chosen annually by the board of directors immediately after the election of each new board.

Section 3. Removal of officers. Any officer may be removed either with or without cause and his successor elected at any regular meeting of the board, provided that not less than four directors' votes are in favor of such removal.

Section 4. The president. The president shall preside at all meetings of the board of directors at which he is present; call to order and act as temporary chairman at all meetings of the stockholders; present at each stated meeting a report of the condition of the business of the company; order the regular and special meeting of the stockholders and directors in accordance with these by-laws; appoint and remove, subject to the approval of the board of directors, all servants, agents, and employees of the company, and fix their compensation, subject to the approval of the board of directors; make and sign contracts for the company, such as appertain to its general business in the absence of any special direction of the board of directors or the executive committee; see that the books, reports, statements, and certificates required by law are properly kept, made, and filed; sign all certificates of stock of the company; and do and perform all acts incident to the duties of president.

Section 5. The vice president. The vice president shall, during the absence or inability of the president, do and perform all the duties of the president, as set forth in these by-laws or in the laws of the State of New York, and when so acting shall have all the powers and be subject to the restrictions given to, or imposed upon, the president.

Section 6. The secretary. The secretary shall keep the minutes of the board of directors and of the stockholders in appropriate books; give and serve all notices of the company; be custodian of the records and of the seal of the company, and affix the latter when required; keep the stock and transfer books in such manner as to show at any time the amount of the capital stock, the manner and time the same is paid in, the names of the owners thereof, alphabetically arranged, their respective places of residence and their post office addresses, the number of shares owned by each, and the time at which each person became such owner; keep such stock and transfer books open daily during the usual hours of business at the office of the company, subject to the inspection of any stockholder or judgment creditor of the company, and permit such stockholder or judgment creditor of the company to make extracts from said books to the extent and as prescribed by law; lay before the board of

directors at their stated meetings all communications addressed to him or coming to his hands appertaining to the business or interests of the company; attend to the correspondence of the company, or such part as may be allotted to him.

Section 7. The temporary secretary. In the absence or disability of the secretary, the directors may appoint a secretary pro tem, who shall have the powers and be subject to the responsibilities of the secretary.

Section 8. The treasurer. The treasurer shall have the care and custody of and be responsible for all the funds and securities of the company, and deposit all funds in the name of the company in such a bank as the directors may designate; sign all checks, drafts, and orders for the payment of moneys, and pay out and disburse money under the direction of the board of directors or in the usual course of business of the company; exhibit at all reasonable times his books and accounts to any director of the company upon application at the office of the company during business hours; countersign all certificates of stock signed by the president; render a statement of the condition of the finances of the company at each stated meeting of the board of directors, if called upon to do so; render a full financial report at the annual meeting of the stockholders; and generally perform all the duties appertaining to the office of treasurer.

The president shall have equal right with the treasurer to sign checks and other negotiable or financial papers.

The treasurer and the president may be required to give a bond by the board of directors, for the faithful performance of the duties of their respective offices, the sum to be determined by the board of directors.

ARTICLE IV. INSPECTORS OF ELECTION

Two inspectors of election shall be elected at each annual meeting of stockholders to serve for one year. In the case of the refusal or inability of either or all of them to act, or his or their absence at the time of election, the meeting may appoint another or others to act.

The inspectors of the election shall, before entering upon the discharge of their duties, be sworn to faithfully execute the duties of inspector according to law. An inspector need not be a stockholder.

ARTICLE V. EXECUTIVE COMMITTEE

The board of directors shall appoint annually two of its members, who, together with the president, shall constitute the executive committee, and shall have management of the affairs and business of the company, subject to the direction of the board, if any directions are given, particularly between the meetings of the board. Such committee shall also act as an auditing committee for the treasurer's accounts, at such times as the board of directors may authorize and particularly previous to the annual meeting.

ARTICLE VI. THE SEAL

The seal of the corporation shall be in the form of a circle, with the name of the company and "Holland Patent, N. Y." arranged thereon with such other matter as may be thought appropriate by the board of directors.

ARTICLE VII. CERTIFICATES OF STOCK

Section 1. The certificates of stock shall be numbered and registered in the order in which they are issued. They shall be bound in a book and shall be issued in consecutive order therefrom, and in the margin thereof shall be entered the name of the person owning the shares therein represented, with the number of shares and the date thereof, and such other memoranda as may be found useful. Such certificates shall exhibit the owner's name and the number of shares. They shall be signed by the president and countersigned by the treasurer and sealed with the seal of the company.

Section 2. The stock of the corporation shall be assignable and transferable on the books of the company only by the person in whose name it appears on said book, or his legal representatives. In case of the transfer by attorney, the power of attorney, duly executed and acknowledged, shall be deposited with the company. In all cases of transfer the former certificate must be surrendered and canceled before a new certificate is issued. No transfer shall be made on the books of the company within ten days preceding the annual meeting of stockholders, and only with the approval of the board, as provided by the certificate of incorporation.

ARTICLE VIII. DIVIDENDS

The board of directors shall by vote declare patronage dividends from the surplus profits of the company whenever in their opinion the condition of the company's affairs will render it expedient for such dividends to be declared by them.

The transfer books shall be closed at least ten days previous to the date of the payment of the dividends on the capital stock.

ARTICLE IX. AMENDMENTS

These by-laws may be amended, altered, or added to, by an affirmative vote of the stockholders, representing two-thirds of the whole capital stock, at an annual meeting or at a special meeting called for that purpose, provided that a written notice shall have been sent to each stockholder of record at his last known post office address at least ten days before such annual or special meeting, which notice shall state the alterations, amendments, or changes which are proposed to be made in such by-laws.

We do hereby certify that the foregoing by-laws were adopted at a meeting of the directors held on January 1, 1903, by a resolution of the board.

....
President

....
Secretary

SUGGESTED FORM OF CONTRACT FOR LEASING A MILK STATION

This contract made and entered into this....................day of ...., 19..., by and between.......................... ...., a corporation organized and existing under and by virtue of the laws of the State of New York, and hereinafter designated as " Station " and................of................, New York, hereinafter designated as " Dealer."

WITNESSETH

1. For and in consideration of the mutual promises and agreements of the parties hereto, the Dealer agrees to lease from the said Station for the period of..........months, from......................19..., to........................, 19..., inclusive, the following described property, to wit:

a. LAND (Enter legal description of parcels of real estate.).....
....
....
....
....
for a monthly rental of $..........................

b. BUILDINGS (Enter description of buildings or ice houses, platforms, and so on.)..............................
....
....
....
....
for a monthly rental of $.........................

c. EQUIPMENT (Enter the description and enumeration of all equipment.)...............................
....
....
....
....
....
for a monthly rental of $.........................

2. In further consideration of the mutual promises and agreement of the parties hereto, said Station agrees to

(Enter description of operating, such as receiving, weighing, testing, cooling, pasteurizing, washing of cans, furnishing of ice and filling of ice house, and so on.)

....
....
....
....

for which said Dealer agrees to pay the Station..................cents per hundred pounds of milk handled.

3. It is further agreed that in the event of injury to the building by fire or other unavoidable accident to the equipment, such as to render it useless for the business therein conducted, the Station may at its option cause the same to be restored within a reasonable time or terminate the lease herein provided, giving the Dealer notice of such intention.

4. It is agreed that the Dealer shall pay the Station the rental and operating charges on or before the tenth day of each and every month.

5. It is further agreed that within one day after the signing and delivery of this agreement, the Dealer shall furnish a satisfactory bond, or make a cash deposit of one-half of the annual rental to be paid the Station as a guarantee of the proper and faithful performance of this agreement, the Station having the right to require a bond at any time.

6. It is agreed that the Dealer shall conduct the Station in a skillful and workmanlike manner and employ therein skilled workmen experienced in the operation of said machinery and qualified to operate the same without injury or damage, except such as may be occasioned by ordinary wear or tear. The Dealer shall at all times keep the machinery in order and repair and keep the premises in a cleanly condition.

7. It is agreed that the Dealer shall not assign this lease or sublet the said premises, or any part thereof, without the consent of the Station.

8. It is further agreed that the failure of the Dealer to comply with the provisions of this agreement, or his insolvency, or any act of bankruptcy shall immediately terminate the lease, and the Station may at its option immediately re-enter the premises, occupy the same, and conduct the business of the Station in all respects, as if this lease had been regularly terminated by the expiration of the lease.

IN WITNESS WHEREOF the parties hereto have set their hands and seal the day, month, and year first above written

................................Station
By........................President
By........................Secretary

................................Dealer
By........................President
By........................Secretary

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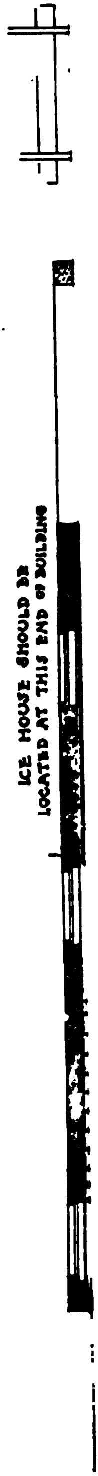

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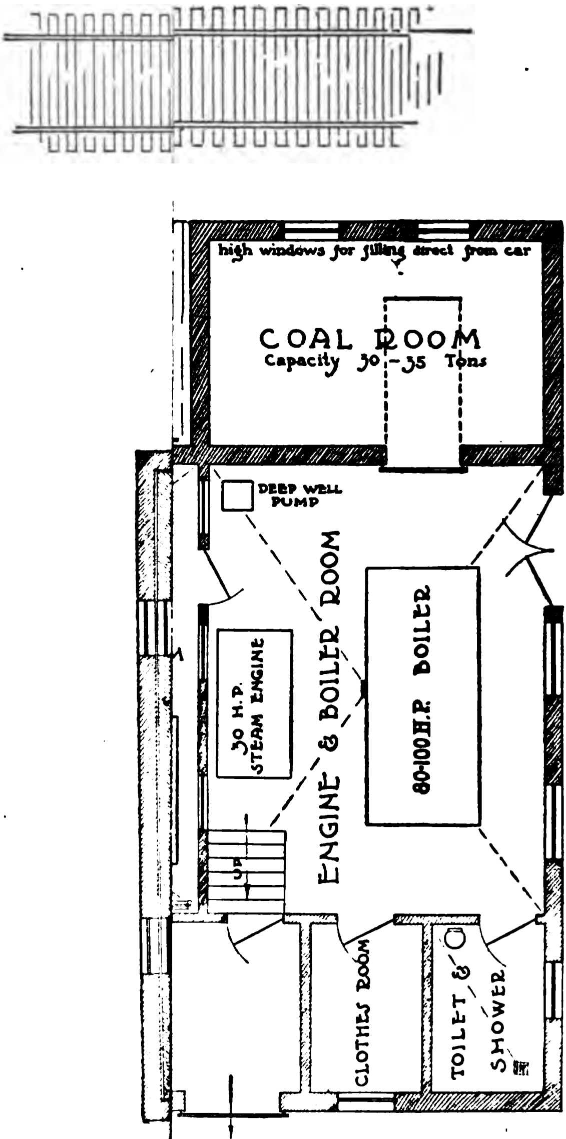
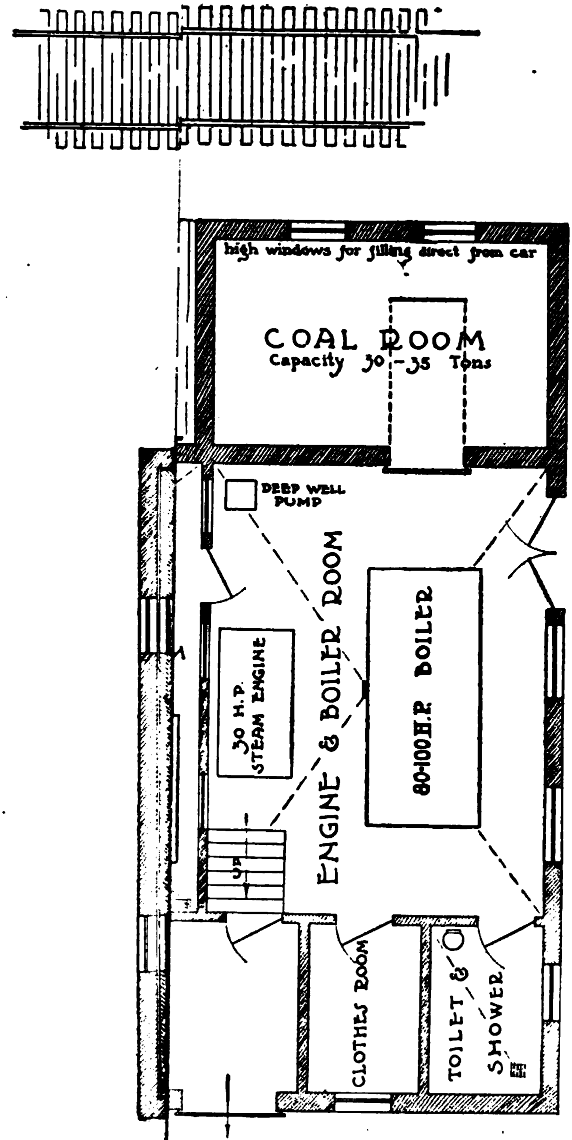

high windows for filling direct from car
COAL ROOM
Capacity 30 - 35 Tons
DEEP WELL PUMP
ENGINE & BOILER ROOM
80-100 H.P. BOILER
30 H.P. STEAM ENGINE
UP
CLOTHES ROOM
TOILET & SHOWER



high windows for filling direct from car
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30 H.P. STEAM ENGINE
UP
CLOTHES ROOM
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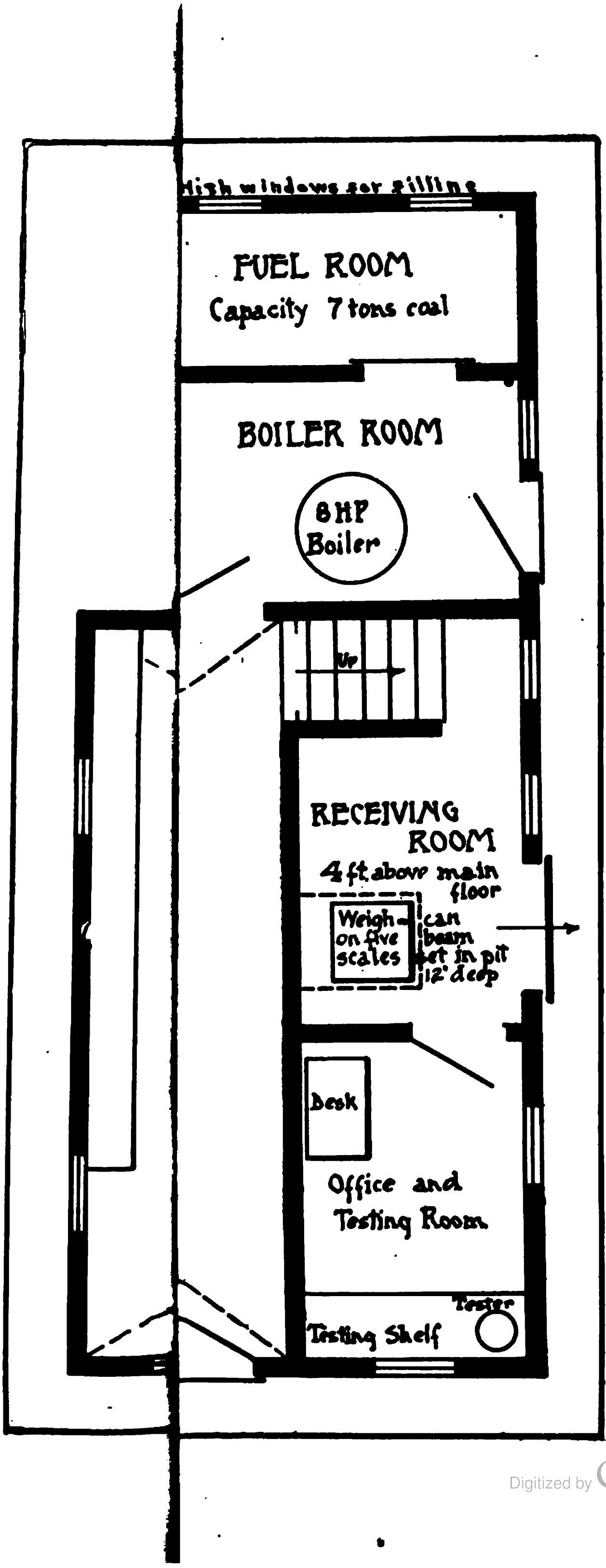
High windows for filling
FUEL ROOM
Capacity 7 tons coal
BOILER ROOM
8 HP
Boiler
Up
RECEIVING
ROOM
4 ft. above main
floor
Weigh-
on five
scales
can
beam
set in pit
12' deep
Desk
Office and
Testing Room
Tester
Testing Shelf

LISTS OF EQUIPMENT

The following are suggestive lists of equipment for plants of the types shown in figures 1 to 9. These lists will not cover the requirements of all cases, of course, and some articles may be omitted. They are given, however, as an aid to new organizations in the selection of apparatus. Owing to the unusual conditions that prevail commercially at this time, it has not seemed desirable to attempt to estimate the cost of apparatus. Prospective builders may obtain quotations from reliable dairy supply houses.

EQUIPMENT FOR COOLING AND CANNING STATION, CAPACITY 15,000 POUNDS MILK

The floor plan for this station is given in figure 1.

One 10 to 12 horse power boiler with safety valve, steam gauge, water column, injector, and so on
One 10 to 15 barrel steel tank for boiler water supply
One 4 horse power engine, if power can washers are used
One water pump, if plant is not supplied with running water
Two double-compartment sinks for washing cans, or two power-driven washers
One 5-beam scale, capacity 600 pounds
One weigh can, capacity 600 pounds
One milk can drainer
One conductor head and pipe to reach vat
One milk vat, capacity 400 gallons
One milk pump, capacity 6000 pounds per hour
One water pump for circulating ice water thru cooler
One tubular milk cooler, surface type, capacity 6000 pounds per hour
One 24-bottle Babcock tester with apparatus
One table
Necessary steam and water pipe and fittings
Necessary shafting, pulleys, and belting
Necessary sanitary pipe and fittings
Toilet room fittings
Office furniture

UTENSILS AND SUPPLIES

One 14-inch adjustable pipe wrench
One 10-inch adjustable pipe wrench
One 10-inch monkey wrench
Boiler firing equipment
Set of tools } not necessary but desirable
Soldering outfit }

One-half pint milk sample bottles with ground glass stoppers
One sampling tube or dipper
One dozen milk sheets
Office supplies, stationery, and so on
One-half dozen pails
One barrel washing powder
Brushes for washing cans, vats, piping, floors, and the like
One barrel each steam cylinder and machine oil
One dozen dairy thermometers
Four hundred 10-gallon milk shipping cans (patrons cans not included)

EQUIPMENT FOR CREAM-SHIPPING STATION IN WHICH COTTAGE CHEESE IS MADE, CAPACITY 10,000 POUNDS MILK

The floor plan for this station is given in figure 2.

One 12 to 18 horse power boiler, with fittings
One 15 to 20 barrel steel tank for boiler water supply
One water pump, if plant is not supplied with running water
Two double-compartment sinks for washing cans or two power-driven washers
One 5-beam scale, capacity 600 pounds
One weigh can, capacity 600 pounds
One can drainer
One conductor head and pipe to reach vat
One milk vat, capacity 300 gallons
One milk pump, capacity 6000 pounds per hour
One pump for circulating cooling water thru pasteurizer
One separator, capacity 3000 to 4000 pounds per hour
One milk heater, capacity 6000 pounds per hour
One cream pasteurizer, capacity 250 to 300 gallons
One Babcock tester and apparatus
Two wash sinks
One table
Two jacketed cheese vats, capacity 500 gallons each
Necessary shafting, pulleys, belts, and the like
Necessary steam and water pipe and fittings
Necessary sanitary pipe and fittings
Office furniture
Toilet room fixtures

UTENSILS AND SUPPLIES

Boiler firing equipment
One 14-inch adjustable pipe wrench

One 10-inch adjustable pipe wrench
One 10-inch monkey wrench
Set of pipe tools } not necessary but desirable
Soldering outfit }
One barrel each steam cylinder and machine oil
One barrel washing powder
One-half dozen pails
One dozen dairy thermometers
Brushes for washing cans, vats, sanitary pipe, sample bottles, and the like
M lk sample bottles with ground-glass stoppers
One sampling tube or dipper
One dozen milk sheets
One hundred 10-gallon cans for handling and shipping cream and pot cheese (patrons cans not included)

EQUIPMENT FOR MILK STATION IN WHICH MILK IS PASTEURIZED AND BUTTER IS MADE, CAPACITY 25,000 POUNDS MILK

The plan of this station is given in figure 3.

One 60 to 80 horse power boiler, with fittings
One 30 barrel tank for water supply
One 30 horse power engine
One water pump, unless water is supplied by pressure
Two can washers, steamers, and driers
One 5-beam scale, capacity 1000 pounds
One twin receiving can, capacity 1000 pounds
One milk can drainer
Two conductor heads, with piping
Two separators, capacity 6000 pounds each per hour
One receiving vat, capacity 400 gallons
One milk pump, capacity 12,000 pounds per hour
One skimmilk pump, capacity 12,000 pounds per hour
One brine circulation pump
One internal tube pasteurizer, capacity 8000 pounds per hour
Three insulated holding tanks for pasteurized milk
One surface tubular cooler, fitted for brine circulation, capacity 8000 pounds per hour
One cream pasteurizer and ripener, capacity 400 gallons
One starter can, capacity 30 gallons
One table
Two wash sinks

One combined churn and worker, capacity 750 pounds butter
One refrigerator, either built-in or purchased complete
One skimmilk tank, capacity 800 gallons
One skimmilk weigher for returning skimmilk to patrons
One 15-ton refrigerating outfit, complete with brine tank, piping, and so on
One 36-bottle Babcock tester, with apparatus
Office furniture
Toilet fixtures
Necessary shafting, pulleys, and belts
Necessary steam and water pipe and fittings
Necessary sanitary pipe and fittings

UTENSILS AND SUPPLIES

Boiler firing equipment
Complete set of pipe tools
Soldering outfit
One barrel each steam cylinder and machine oil
One barrel oil for compressor
Calcium chloride
Ammonia
Washing powder
Butter salt
Butter color
Brushes for cans, vats, piping, and bottles
One milk-sampling tube or dipper
One-half pint sample jars with glass stoppers
One-half dozen pails
One dozen dairy thermometers
Butter packages, parchment paper, shipping tags, and the like
Seven hundred 10-gallon milk shipping cans (patrons cans not included)

EQUIPMENT FOR CREAM-SHIPPING OR BUTTER-MAKING GRAVITY SYSTEM PLANT, CAPACITY 20,000 POUNDS MILK

The plan of this plant is given in figure 4.

One 15 to 20 horse power boiler, with fittings
One 20 barrel steel tank for boiler water supply
One well pump, if necessary
One 6 to 8 horse power engine
One 5-beam scale, capacity 600 pounds
One square receiving can, capacity 600 pounds

One conductor head with pipe to reach vat
One milk receiving vat, capacity 400 gallons
One milk pump, capacity 4000 to 6000 pounds per hour
One milk heater, capacity 6000 to 8000 pounds per hour
One separator, capacity 4000 to 6000 pounds per hour
} dependent on amount of milk handled
One cream pasteurizer, capacity 300 to 500 gallons
One starter can, capacity 30 gallons
One combined churn and butter worker, capacity 750 pounds butter
One table
One skimmilk vat, capacity 600 to 800 gallons
One skimmilk weigher, for returning skimmilk to patrons
One refrigerator, either built-in or purchased complete
One can-washing sink and steamer, if cream is shipped
One wash sink
One Babcock tester, with apparatus
Office furniture
Necessary shafting, pulleys, and belts
Necessary steam and water pipes and fittings
Necessary sanitary pipe and fittings
Toilet fixtures

UTENSILS AND SUPPLIES

Boiler firing equipment
One 14-inch adjustable pipe wrench
One 10-inch adjustable pipe wrench
One 10-inch monkey wrench
Set of pipe tools
Soldering outfit
} not necessary but desirable
Steam cylinder and machine oils, butter packages, parchment paper, salt, butter coloring, washing powder, butter ladles, butter packer, milk sample jars, dairy thermometers, milk sheets, milk sampling dippers, and the like
Cans, if cream is to be shipped

EQUIPMENT FOR MILK PASTEURIZING AND BOTTLING PLANT, CAPACITY 20,000 POUNDS MILK

The plans for this plant are given in figures 6 and 7.

One 80 to 100 horse power boiler or two 40 to 60 horse power boilers, with fittings
One large water tank for boiler supply
One water pump, if necessary
One 30 horse power engine

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One 15-ton refrigerator outfit, complete with brine tanks, brine pump, and all necessary pipe and fittings
One power-operated can washer with steaming and drying fixtures
One power-driven bottle washer, or for maximum capacity one automatic bottle washer, rinser, and sterilizer (if automatic washer is used, sterilizing room may be omitted, and bottle washing room enlarged)
One 5-beam scale, capacity 1000 to 1500 pounds, or similar automatic scale
One can drainer
One twin receiving can, capacity 1000 to 1500 pounds
Two conductor heads, with piping
Two receiving vats, capacity 400 to 600 gallons each
One sanitary milk pump, capacity 8000 to 12,000 pounds per hour
One internal tube pasteurizer, capacity 8000 pounds per hour
Three insulated holding tanks for heated milk
One continuous surface tubular milk cooler, capacity 8000 pounds per hour, fitted for both water and brine
Two continuous rotary bottle fillers
One power-operated elevator
Three jacketed cheese vats, capacity 800 gallons each
Three continuous pressure cheese presses
Two separators, capacity 4000 to 6000 pounds
One cream ripener, capacity 500 gallons
One combined churn and butter worker, capacity 750 pounds
One starter can, capacity 50 gallons
One table
Three wash sinks
One 36-bottle Babcock tester, with apparatus
Three trucks for handling milk bottle cases
One truck for handling butter and cheese
Office furniture
Toilet fixtures
Necessary shafting, belting, and pulleys
Necessary steam and water pipe, with fittings
Necessary sanitary pipe, with fittings

UTENSILS AND SUPPLIES

Boiler firing equipment
Complete set of pipe tools
Soldering outfit
Sixty gang press cheese hoops

Two each perpendicular and horizontal wire curd knives
Two cheese knives
Two speed knives
One curd mill
One paraffining tank
Vacuum apparatus for transferring cream to churn
Butter and cheese packages, parchment paper, cheese bandages, cloth circles, scale boards, salt, rennet extract, paraffin, cheese coloring, butter coloring, bottles, caps, cases, cans, sample jars, milk sheets, curd scoops, curd pails, curd rakes, whey strainers, whey siphons, thermometers, rennet test outfit, acid and moisture test outfits, butter ladles, butter packers, pails, dippers, washing powder, and brushes for washing cans, vats, pipes, floor, bottles, test and sample bottles
One barrel each steam cylinder, compressor, and machine oil
Ammonia
Calcium chloride
Packing, cotton waste, belt lacing, and the like

EQUIPMENT FOR WHOLE MILK CHEDDAR CHEESE FACTORY, CAPACITY 10,000 POUNDS MILK

The plan for this factory is given in figure 8.

One 8 horse power boiler, with fittings
One 5 to 10 barrel steel tank for water supply
One water pump, if necessary
Small steam or gasoline engine, if power-driven curd mill is desired
One 5-beam scale, capacity 600 pounds
One weigh can, capacity 600 pounds
One conductor head and pipe sufficient to reach vats
Two jacketed cheese vats, capacity 700 gallons each
Two continuous pressure cheese presses
One wash sink
One paraffin tank
One steel whey tank, capacity 40 barrels
One 24-bottle Babcock tester, with apparatus
Office furniture
Necessary steam and water pipe and fittings

UTENSILS AND SUPPLIES

Boiler and firing equipment
One 12-inch adjustable pipe wrench; one 10-inch monkey wrench

Sample dipper and jars, vertical and horizontal curd knives, cheese knife, speed knife, curd scoops, curd pails with flat side, long- and short-handled dippers, wire gauze strainer dipper, whey strainer, siphon tube, curd rakes, dairy thermometers, rennet, acid, and moisture testing outfits, curd mill, forty gang press hoops, cheese boxes, bandages, cloth circles, scale boards, salt, rennet or pepsin extract, cheese coloring, milk sheets, washing powder and brushes for cleaning vats, test and sample bottles, and floors

EQUIPMENT FOR COMBINED BUTTER AND CHEESE FACTORY, CAPACITY 10,000 TO 12,000 POUNDS MILK

The plan of this factory is given in figure 9.

The cheese making side of this plant will need practically the same equipment as that required for the cheese factory (fig. 8), less the boiler and the engine, with the following additional equipment:

One 15 to 18 horse power boiler, with fittings
One 6 to 8 horse power engine
One milk receiving vat, capacity 400 gallons

<table>
<tr><td>One milk pump, capacity 4000 to 6000 pounds per hour
One milk heater, capacity 6000 to 8000 pounds per hour
One separator, with interchangeable milk and whey bowls, capacity 4000 to 6000 pounds</td><td>size dependent on the maximum amount of milk to be handled</td></tr>
</table>

One wash sink
One starter can, capacity 30 gallons
One cream ripener, capacity 300 gallons
One combined churn and butter worker, capacity 600 pounds of butter
One refrigerator, either built-in or purchased complete
One buttermilk tank
One power-driven elevator
Larger water supply tank is desirable, and additional steam and water piping for butter room is necessary

UTENSILS AND SUPPLIES

Butter ladles, packers, and butter printer, if desired
Butter packages, parchment paper, cloth circles, butter coloring, salt, steam cylinder and machine oils

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A. R. Mann, Director of Extension Service

The European Corn Borer

E. P. Felt

Published and distributed in furtherance of the purposes provided for in the
Act of Congress of May 8, 1914

THE EUROPEAN CORN BORER

Pyrausta nubilalis Hübner

E. P. Felt [1]

The discovery of the European corn borer in the vicinity of Schenectady presents a serious problem, since this pest is one of the most injurious insects introduced into America. It was discovered in Massachusetts in 1917, probably in hemp, and is known to be very injurious in that State over an area of about three hundred and twenty square miles west, north, and northeast of Boston. The infestation at Scotia, New York, covers about four hundred square miles, extending west to Fort Hunter and east of Schenectady. Further examination will probably disclose a somewhat larger infested area. The occurrence of this corn borer on the Mohawk flats is particularly dangerous, for these areas are annually flooded and infested stalks may be carried down the river and deposited almost anywhere between Schenectady and New York City, or may even drift to points beyond New York.

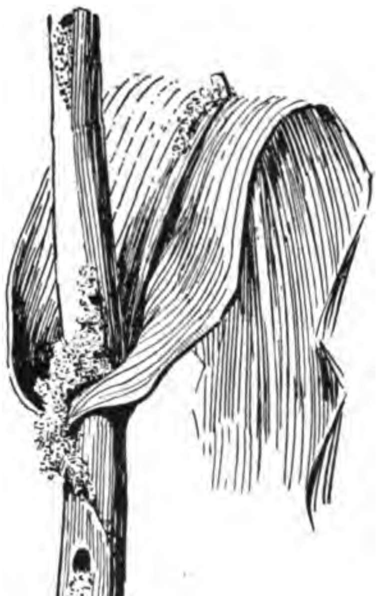

FIG. 10. PORTION OF A CORNSTALK WITH CHARACTERISTIC HOLES AND BORINGS HANGING FROM THEM, MADE BY THE CORN BORER

In winter the holes are usually closed and are slightly discolored on the margins

IMPORTANCE OF THE EUROPEAN CORN BORER

This pest has a bad record in Europe, and has caused annual losses of fifty per cent to corn and hemp plants in central Europe. The past two years have shown it to be very destructive to both sweet corn and field corn in eastern Massachusetts. During field counts last year Federal and State agents found on a quarter of an acre of sweet corn one hundred per cent of the ears infested, and in such areas an average of forty-six caterpillars to a plant. As many as three hundred and eleven full-grown caterpillars have been found in one hill of corn, and one hundred and seventeen in one plant. Badly affected stalks are

[1] State Entomologist of New York.

thoroly honeycombed, and this causes them to break or lodge. The ears may be blighted by the pests working in the supporting stalk, or the cob may be tunneled from top to bottom and from side to side and many of the kernels destroyed. As many as fifteen full-grown caterpillars, each nearly an inch long, have been found feeding upon and within a single ear of sweet corn, altho one caterpillar is enough to damage an ear seriously.

Since corn is the largest American crop, general prevalence of conditions such as those described would result in annual losses easily approximating a billion dollars or more.

The occurrence of two generations of the insects a year and the great fecundity of the pest, mean that a comparatively slight infestation in the spring may result in serious damage toward the end of the season. It has been estimated that the progeny from even one moth might result in one hundred thousand to three hundred thousand caterpillars at the close of the season. Furthermore the insect lives in a variety of thick-stemmed plants, and, owing to its boring habits, can be successfully controlled only by burning all infested stems or stalks, a tremendous and costly undertaking if generally necessary thru the corn-growing area.

These facts justify an earnest attempt to exterminate the insect. This measure, tho costly, would be much more economical in the long run than comparatively ineffective efforts to control the insect over large areas. The cooperation of every one is needed to destroy the insect before it has escaped beyond the possibility of control. All persons interested in the welfare of the country are requested to assist in locating and destroying this pest, since its extermination will mean the keeping of corn production at its present level.

SIGNS OF INFESTATION

The European corn borer can be detected easily in winter. Its presence in the stalks is indicated by characteristic holes about one-eighth inch in diameter, generally with discolored margins and usually plugged with borings. These entrance holes (Plate I and fig. 10) are most easily seen on stalks that have been stripped of leaves by cattle. The holes lead into irregular burrows, or galleries (Plate I and fig. 11), from one inch to several inches in length, each of which is inhabited by a yellowish gray caterpillar about three-fourths inch in length. The head of this caterpillar is brown, and the body is minutely spotted with brown. The galleries that reach to the nodes are in many cases irregularly enlarged at this point. The work of the borer is also found in stubble.

The injury to green corn in the field is more conspicuous. The holes are marked by hanging masses of borings and in many cases by exuding sap. Similar perforations may also be in the husks and the stem of the

ear (fig. 13); the cob and the grain itself may be tunneled by the borers. Broken tassels (fig. 12) with extruded borings at the point of injury are easily recognized signs of infestation. In this country this is the only corn pest that habitually bores in the stalks and the cobs and at the same

FIG. 11. CORN BUTTS WITH CATERPILLARS OF THE CORN BORER IN THEIR BURROWS

time injures the kernels (fig. 13). Further details concerning the work of the pest follow. Samples of cornstalks suspected of being infested should be sent to the farm bureau agent or the nearest entomologist.

FOOD PLANTS

The principal food plants of the European corn borer, as shown by investigations in Massachusetts, are sweet corn, field corn, fodder corn, celery, beans, potatoes, swiss chard, beets, spinach, dahlias, gladiolus, chrysanthemums, and several of the larger-stemmed weeds and grasses, notably barnyard grass and the common ragweed, or Roman wormwood. Some of these plants become infested simply because they are growing

in or near infested cornfields. The ability of this insect to maintain itself in weeds greatly increases the difficulty of adequate control or of extermination.

LIFE HISTORY AND HABITS

The European corn borer has at least two and possibly three generations each year. The moths of the first generation are on the wing from the middle of May to the latter part of June. They are nocturnal in their habits, and about nine o'clock in the evening make flights of twenty or thirty feet at a height of six feet or more above the ground. The moths lay their eggs on the undersurface of corn leaves in shingle-like, oval patches. The average for the first brood is two hundred and seventy-three, and for the second seven hundred and twenty-seven. Egg laying begins about three days after the moths emerge, and continues for about twelve days. The young larvae eat out small areas on the leaves, and as they increase in size descend and attack the unfolded tassel. Later they work on the lower portion of the tassel and cause a characteristic breaking or bending at its base. The older caterpillars enter the stalk and tunnel thru all parts of the plant except the fibrous roots. The plant is weakened, development is retarded, and in many cases defective fertilization results from injury to the tassel. The stalk and the cob are also tunneled. As many as fifteen full-grown larvae have been found in one ear. The damage to stalk and ears is in many cases increased by the entrance of various

FIG. 12. BROKEN TASSEL AND BORINGS, AN EASILY RECOGNIZED SIGN OF CORN BORER WORK

CORNSTALK AND EAR SERIOUSLY INJURED BY THE EUROPEAN CORN BORER

Note the numerous caterpillars in the stems and a characteristic hole with discolored margin

BORERS TAKEN FROM
A SINGLE HILL OF
CORN, 311 IN ALL

EARS OF CORN INJURED BY BORERS

rots and the subsequent decay of the affected parts. Thru field counts in a quarter-acre plot of sweet corn all the ears were found to be infested, and similar examinations in badly infested areas showed an average of forty-six caterpillars to a plant, or about one million and fifty thousand

FIG. 13. CORNCOB AND HUSK SERIOUSLY INFESTED WITH BORERS

to an acre. The average length of the larval period for the first brood is forty-four days, the maximum being fifty-seven and the minimum thirty-seven days. The first pupae of the spring brood were found on July 11 and were most abundant from July 19 to 23. The pupal stage lasts about eight days.

The moths of the second brood appear from July 27 to August 4, and deposit on an average about six hundred eggs, the maximum being nine hundred and three. The life cycle requires about fifty-nine days. The caterpillars of the second brood cause the most damage. They continue feeding until checked by cold weather. The insect passes the winter in the larval condition within the stalks. The final transformations occur in the spring, and the moths issue any time from the middle of May to the latter part of June, as already stated.

DESCRIPTION

The female moth is pale yellow, with a stout body and a wing expanse of a little over an inch. The outer third of the fore wing is marked by two darker serrate lines; the hind wings are unmarked. The male moth is reddish brown and has a long, slender body. It is slightly smaller and much darker than the female. On the fore wings of the male moth is a pale yellow streak between the two serrate lines, and two small yellowish spots are near the middle. The hind wings are grayish with a broad band of pale yellow.

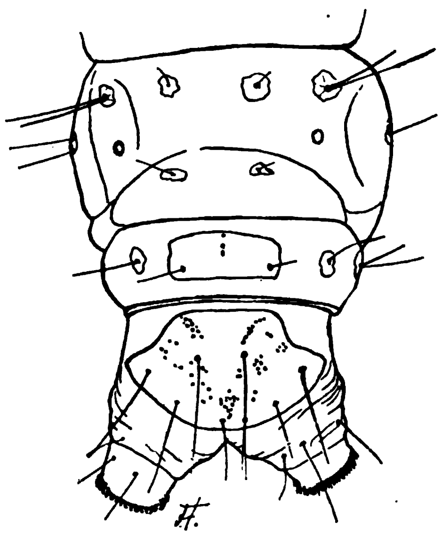

FIG. 14. POSTERIOR EXTREMITY OF A CORN BORER FROM ABOVE, SHOWING TUBERCLES, OR WARTS, AND HAIRS

The caterpillars are about three-fourths inch in length when full grown, yellowish gray, brown headed, minutely brown spotted, and with indistinct longitudinal reddish or dusky stripes. They may be distinguished from other corn borers by the series of well-developed, horny, light brown tubercles, each with one or more short, stout hairs. The arrangement of the tubercles on the hind portion of the caterpillar is shown in figure 14. These are the only caterpillars that feed on the developing tassels, bore in all portions of the stem and the cob, and devour the kernels on the cob.

DISTRIBUTION

This corn borer is recorded as widely prevalent in central and southern Europe, west, central, and northern Asia, China, and Japan. Such a wide distribution indicates probable ability to thrive thruout the Corn Belt, and makes the problem of control or extermination a national and not a local one.

This dangerous pest is known to be present in thirty-four towns in eastern Massachusetts, comprising an area of about three hundred and twenty square miles west, north, and northeast of Boston. In New York it has been found at Scotia, Schenectady, and west to Fort Hunter.

MANNER OF SPREADING

The methods by which this insect establishes itself in new localities are worthy of special consideration. Fortunately the moths do not fly great distances; otherwise the present infested area would be considerably larger after two or more seasons of nearly unchecked breeding. Since the larvae pass the winter in burrows, the pest can be widely disseminated by the shipment of infested plants or parts of plants, notably corncobs and cornstalks, and, in summer, green corn. There is also danger, tho to a much less extent, of the insect being transported to a new locality in some of its minor food-plants, especially celery, swiss chard, beans, beets, spinach, dahlias, and chrysanthemums; however in most instances infestation would lead to the rejection of the plants as being unfit for sale. These conditions make it very desirable to restrict closely the sale and distribution of plants or portions of plants from the infested area and to conduct exterminative or remedial measures so as to reduce to a minimum the probability of the insect being carried to uninfested localities. This is of special importance to an infested area along a stream and above an uninfested area, as is the case at Scotia.

CONTROL AND EXTERMINATION

Experience in Massachusetts has shown that the only effective method of control is by burning all infested stalks and weeds. This is a costly undertaking in a market garden region and relatively much more expensive in a farming section. The fecundity of the insect is such that even were these measures carried out systematically and thoroly the control would be only partial, since a very slight infestation in the spring would be sufficient to result in considerable injury before the end of the season.

By a more intensive system of cleaning up and burning than would be practical under ordinary farm conditions, this pest could be exterminated; and, after carefully weighing the various factors involved, entomologists unhesitatingly recommend an earnest effort to destroy completely this borer not only in New York State but wherever it has become established. The successful prosecution of this policy depends on the cooperation of all farmers and agricultural workers, particularly in detecting and reporting promptly any scattered infestations. Such infestations are likely to appear in sweet corn, at least this has been the case in the areas already known to be infested.

PREVENTION OF SPREAD

Persons living in infested regions should be very careful not to send out any materials that might possibly contain living caterpillars of this pest. Such materials are cornstalks, corn on the ear, and the various thick-stemmed food-plants mentioned in the list on page 37. Persons living in uninfested regions should be equally careful not to accept infested material from regions where this pest occurs. It is much easier to exclude the insect than to exterminate it after it has become established.

ACKNOWLEDGMENT

Figs. 10, 11, 12, and 13 are from drawings made in the Bureau of Entomology, United States Department of Agriculture.

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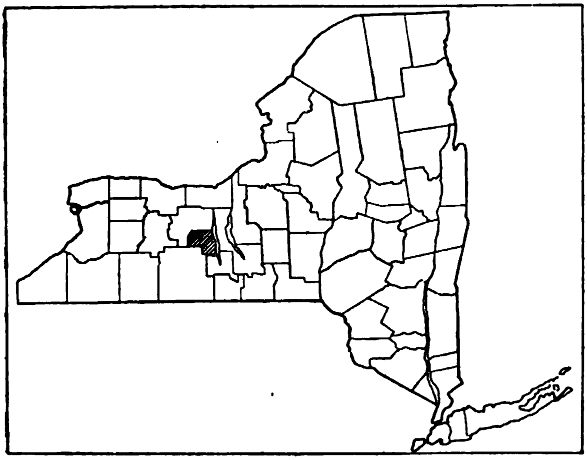
A. R. Mann, Director of Extension Service
In cooperation with the United States Department of Agriculture, Bureau of Soils

Soil Survey of Yates County New York



The shaded part shows the location of the surveyed area

E. T. Maxon, of the United States Department of Agriculture

Under the direction of
Elmer O. Fippin

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RESOLUTION PROVIDING FOR THE FEDERAL PUBLICATION AND DISTRIBUTION OF SOIL SURVEY REPORTS

[PUBLIC RESOLUTION — No. 9]

JOINT RESOLUTION amending public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, "providing for the printing annually of the report on field operations of the Division of Soils, Department of Agriculture."

Resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That public resolution numbered eight, Fifty-sixth Congress, second session, approved February twenty-third, nineteen hundred and one, be amended by striking out all after the resolving clause and inserting in lieu thereof the following:

That there shall be printed ten thousand five hundred copies of the report on field operations of the Division of Soils, Department of Agriculture, of which one thousand five hundred copies shall be for use of the Senate, three thousand copies for the use of the House of Representatives, and six thousand copies for the use of the Department of Agriculture: *Provided*, That in addition to the number of copies above provided for there shall be printed, as soon as the manuscript can be prepared, with the necessary maps and illustrations to accompany it, a report on each area surveyed, in the form of advance sheets bound in paper covers, of which five hundred copies shall be for the use of each Senator from the State, two thousand copies for the use of each Representative for the Congressional district or districts in which the survey is made, and one thousand copies for the use of the Department of Agriculture.

Approved, March 14, 1904.

[On July 1, 1901, the Division of Soils was reorganized as the Bureau of Soils.]

EXPLANATORY STATEMENT

The subjoined is a report on the Soil Survey of Yates County, accompanied by a large-scale map in colors showing the distribution of the several types of soil recognized and described. This survey was made by E. T. Maxon, representing the Bureau of Soils of the United States Department of Agriculture. The work was done in cooperation with the United States Bureau of Soils, of which Milton Whitney is Chief, Curtis F. Marbut is in charge of Soil Survey, and W. E. McLendon is Inspector of the Northern Division. A limited edition of this report is published by the United States Department of Agriculture as a separate from the Field Operations of the Bureau of Soils, but this College has none of these reports for distribution.

A. R. MANN,
Dean.

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MAP

Soil map, Yates County sheet, New York

SOIL SURVEY OF YATES COUNTY, NEW YORK

By E. T. MAXON.—Area Inspected by W. E. McLENDON

DESCRIPTION OF THE AREA

Yates County is situated in the central part of western New York. On the east Seneca Lake separates it from Seneca and Schuyler Counties, on the south the county is bounded by Schuyler and Steuben Counties, and on the west and north by Ontario County. Yates County has an area of 343 square miles, or 219,520 acres.

The surface ranges from undulating or gently rolling in the extreme eastern and northeastern parts of the county to hilly or semimountainous in the southern and southwestern parts. Starkey and Torrey Towns and the eastern part of Milo and Benton Towns are as a whole undulating to gently rolling. This part of the county may be considered as including two topographic divisions, the one comparatively smooth, the other more rolling. The smoother belt lies in the eastern part of Milo Town and the northeastern part of Starkey Town, and consists of a sloping plain, bordered by very narrow, deep ravines which have been cut back a short distance from the Seneca Lake front. The more rolling part consists of relatively smooth hills, with gentle slopes, giving way in the northwestern part of Benton Town and the northeastern part of Potter Town to low, rounded hills of drumloidal character.

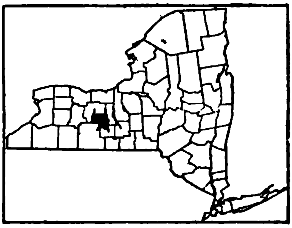

FIG. 15.—Sketch map showing location of the Yates County area, New York

Most of the upland is rolling and included in five distinct ridges. These extend in a general north-south direction and have for the most part rather flat tops and steeply sloping sides. The intervening valleys are comparatively narrow and deep.

There is a range in elevation from 440 feet above sea level along Seneca Lake to 2,110 feet in the southwestern part of the county. The greatest variations in elevation occur along the valleys in the western part of the county, especially the Middlesex and Italy Hollow valleys, where the hills rise as much as 600 to 800 feet in half a mile. Benton, in the northeastern part of the county, has an elevation of 838 feet above sea level; Overacker Corners, in the northwestern part, 1,036 feet; Italy Hill, in the southwestern part, 1,605 feet; and Dundee, in the southeastern part, 985 feet.

The upland region of the county is fairly well drained through small streams and depressions that reach nearly every farm. West River and Flint Creek are the two largest streams in the northwestern part of the county. Their tributaries flow rapidly until the flats are reached, where the streams meander sluggishly through swamps. The largest watercourse in the southeastern part of the county is Big Stream, which flows in an easterly direction, emptying into Seneca Lake through a deep ravine. Most of the drainage of Yates County empties into Lakes Canandaigua, Keuka, and Seneca, and ultimately reaches the St. Lawrence River. Keuka Lake Outlet. with a descent of 260 feet in 7 miles, affords excellent water power for a number of paper and grist mills.

The first permanent white settlement in Yates County was made south of Dresden in 1788. Following this settlements were established throughout the uplands. The pioneers came from Rhode Island, Connecticut, and Pennsylvania. In 1880 the population of Yates County was 21,087. By 1909 the population had decreased to 18,642. The loss has been greater in the rural districts than in the towns. The present population is largely made up of descendants of the pioneers, the newcomers being English, German, Norwegian, and Dutch. About 75 per cent of the population is rural. The density of the rural population is given by the census of 1910 as 40.9 persons per square mile.

Penn Yan, the county seat, with a population of 4,509, is the largest town in the county. It is on two railroads and at the foot of navigation on Lake Keuka, and is an important trading center. Other towns with their population in 1910 are: Dundee, 1,228; Rushville, 463; Dresden, 345; Middlesex, 320; Himrod, 318; Branchport, 273; and Bellona, 200.

The county is fairly well supplied with transportation facilities. The Northern Central and New York Central railroads traverse the eastern part north and south, and a branch line of the Lehigh Valley System extends through the northwestern part. An electric railroad carrying both passengers and freight runs from Penn Yan to Branchport. Boat service is available during part of the season on Lakes Keuka, Seneca, and Canandaigua. These various transit lines provide efficient service for the shipping of farm produce and perishable fruit.

The public roads are in good condition. The main road north and south through the county, passing Benton Center, Penn Yan, and Dundee, is of macadam construction. Every town in the county makes a more or less systematic effort to keep the dirt roads in good condition, and it is only in the more remote and rougher sections that difficulty is encountered in hauling farm produce. Rural mail delivery and telephone service is available to most farms.

Penn Yan, Dundee, Dresden, Bellona, and Rushville are the most important local markets. The principal markets outside the county are Buffalo, New York, Boston, Philadelphia, Baltimore, and the coal-mining towns of eastern Pennsylvania.

CLIMATE

The climate of Yates County is similar to that prevailing throughout western New York. The numerous bodies of water moderate the temperature in their immediate vicinity and are responsible in a measure for the form of agriculture carried on. Their influence is especially important in grape growing, which flourishes along these lakes.

Climatic statistics from the Weather Bureau station at Shortsville, in Ontario County, at an elevation of 640 feet above sea level, are applicable to the eastern part of Yates County and to the region immediately bordering the lakes, but they apply in only a general way to the higher elevations of the county. The following table gives the normal monthly, seasonal, and annual temperature and precipitation as recorded at Shortsville:

Normal monthly, seasonal, and annual temperature and precipitation at Shortsville, Ontario County

Month	Temperature			Precipitation		
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1911)	Total amount for the wettest year (1901)
	° F.	*° F.*	*° F.*	*Inches*	*Inches*	*Inches*
December	27.8	63	—6	2.00	1.86	2.44
January	24.7	64	—12	1.80	.52	1.31
February	21.8	62	—16	1.60	1.14	1.31
Winter	24.8	64	—16	5.40	3.52	5.06
March	32.8	84	—5	2.30	1.59	1.26
April	44.0	88	15	2.90	1.31	4.93
May	56.1	90	28	2.70	1.99	3.56
Spring	44.3	90	—5	7.90	4.89	9.75
June	65.2	89	36	3.20	1.69	2.65
July	70.2	102	44	4.10	3.14	4.62
August	67.9	93	43	2.90	3.94	5.60
Summer	67.8	102	36	10.20	8.77	12.87
September	62.7	91	34	2.60	3.57	2.35
October	51.5	82	26	2.80	2.46	1.11
November	39.0	75	11	1.90	1.18	1.87
Fall	51.1	91	11	7.30	7.21	5.33
Year	47.0	102	—16	30.80	24.39	33.01

The winters are moderately cold and the summers are warm. The average length of the growing season is 163 days. Shorter seasons prevail in the hill lands, especially in the poorly drained areas. The average date of the last killing frost in the spring as recorded at Shortsville is May 8, and that of the first in the fall, October 19. Killing frost has been recorded here as late in the spring as May 31, and as early in the fall as September 30.

The precipitation is well distributed throughout the year, averaging 5.40 inches for the winter, 7.90 inches for the spring, 10.20 inches for the summer, and 7.30 inches for the fall. The rainfall is heaviest during the growing season and lightest during the harvesting and winter months. Snow usually covers the ground during most of the winter.

AGRICULTURE

At the time of settlement this region was heavily forested with hard maple, white oak, hickory, and black walnut, especially in the section adjacent to Seneca Lake; chestnut grew on the dry ridges, and ash, elm, butternut, basswood, and pine on the higher hills of Jerusalem and Barrington Towns. Wild fruits, consisting largely of plum, cherry, grape, and raspberry, grew in profusion. The Indians had cleared small patches of land, on which they grew corn. The white settlers cleared the land on a larger scale and grew wheat, corn, and vegetables. Some cattle and sheep were kept, the milk being made into butter and cheese and the wool into clothing. With the development of agriculture, wheat, corn, oats, barley, butter, cheese, and wool were produced in sufficient quantities for sale. They were carried over the lakes to the larger markets until 1852, when the Northern Central Railroad extended its line through the county. The building of this line encouraged the production of fruit and perishable produce.

At present the agriculture of Yates County consists of the production of grain, hay, beans, apples, and grapes. Dairying and sheep raising are carried on to some extent. The acreage devoted to corn, oats, wheat, barley, and buckwheat has decreased in the last 30 years by 25,633 acres.

In 1879 there were 11,765 acres in corn, which gave an average yield of 41 bushels per acre. The acreage has gradually decreased since that year, and in 1909 corn was grown on only 8,987 acres. Corn is being used to an increased extent as ensilage for dairy stock.

The area in oats has steadily increased from 11,159 acres in 1879, yielding an average of 34 bushels per acre, to 19,389 acres in 1909, yielding 23 bushels per acre. The decrease in yield may be due to the use of less productive land. The oat crop is largely fed on the farm.

Wheat has always been an important crop in this section, but the acreage has varied widely during the last 30 years. In 1879 24,649 acres produced 347,250 bushels, or an average of 14 bushels per acre. By 1889 the acreage had dropped to 14,337 bushels, but the yield per acre averaged 18.8 bushels. In 1899 22,431 acres were seeded to wheat, which produced 390,740 bushels. In 1909 only 12,090 acres were reported, but the average yield amounted to 24 bushels. The acreage from year to year is largely dependent upon market conditions, as most of the wheat is sold.

Barley became one of the important crops at an early period. The highest production was attained in 1879, when 21,961 acres were seeded, producing 506,351 bushels, or an average of 23 bushels per acre. Since 1889, when 16,877 acres were seeded, the acreage has decreased rapidly, and only 2,009 acres were devoted to barley in 1909.

Buckwheat and rye have been grown to a greater or less extent during the last 50 years. The area in buckwheat increased from 1,311 acres in 1879 to 2,737 acres in 1909, and of rye from 717 acres to 3,179 acres during the same period. These crops are generally grown for use on the farm.

The growing of potatoes for sale has not been extensively developed. In 1879 potatoes were grown on 1,759 acres. The acreage has remained almost stationary, the crop occupying 2,667 acres in 1909. The production in that year was 235,657 bushels.

Beans have long been an important crop. The production of beans has ranged from 12,109 bushels in 1879 to 6,442 bushels in 1889 and 49,857 bushels in 1899. In 1909 62,037 bushels were produced on 6,042 acres, the average yield being about 10 bushels per acre.

The acreage devoted to hay and forage crops has not shown much change during the last 30 years. In 1879 hay was harvested from 28,800 acres and produced 27,249 tons. In 1909, 39,961 acres produced 39,804 tons. About half the hay consists of clear timothy, which is usually baled and sold. The mixed timothy and clover hay is largely fed to work stock on the farm. The acreage in alfalfa is being gradually extended.

The natural adaptation of this region to fruit was recognized by the Indians, who set out apple trees, and later by the white settlers, who grew also other fruits. In the 30-year period from 1879 to 1909 the annual value of the orchard products of Yates County has increased from $84,322 to $806,977. About 23 per cent of the total income from all farm products is derived from fruit. The census of 1909 gives the production of tree and small fruits as follows: Apples, 238,606 bushels; peaches, 23,809 bushels; plums, 13,702 bushels; cherries, 4,364 bushels; quinces, 1,437 bushels; strawberries, 67,293 quarts; and raspberries, 854,517 quarts. A large proportion of the raspberries

are dried on the farm and sold by the pound. In 1909 there were 7,920 pounds of nuts gathered.

The production of grapes on the steep hillsides bordering the lakes has long been an important industry. Plantings were first made about 1855. The acreage was gradually extended with the introduction of wine making. In 1909 there was an estimated area in grapes of 7,940 acres.[1]

The census of 1910 reports a production of 36,941,168 pounds of grapes in Yates County. The grapes are either packed in baskets for the retail trade or are made into wine. A large proportion of the champagne produced in the United States is made around Keuka Lake. The Concord, Catawba, Delaware, and Niagara grapes are most extensively grown.

The early settlers brought a few cattle and sheep and began stock farming on a small scale. Butter and cheese were manufactured for home consumption, but dairying never became an important industry. The 1910 census reports a total of 10,303 cattle in the county, of which 5,566 were milch cows. Most of the milk from the dairy farms is made into butter. In 1909 the value of all dairy products, excluding milk and cream used in the home, was $192,714. In proportion to its area, Yates County is one of the leading counties in the State in sheep raising and wool production. In 1910 there were 36,554 sheep in the county, having a valuation of $181,244.. The 1910 census reports 7,884 hogs on farms. Much of the pork produced is used for home consumption, the surplus being disposed of through the local markets. On nearly every farm some poultry is raised, the average number kept per farm being 55 fowls. In 1909 there were 572,085 dozen eggs sold, and the receipts from the sale of poultry and eggs amounted to $148,682. The value of the honey produced in 1909 was $2,816.

It has long been recognized that the topography of the land is an important factor in grape growing. The most successful vineyards are found along the slopes adjacent to large bodies of water, on land that would otherwise be practically valueless for crops. The farmers realize that apples and peaches do better on soils of the Ontario series than they do on the hill lands embraced in the Volusia series. Most of the farmers recognize that it is very difficult to obtain a stand of alfalfa on any soils except strong, well-drained types, such as the members of the Ontario, Chenango, and Wooster series. It is also recognized that wheat does better on brown silty soils, usually derived from limestone, than on lighter-colored and somewhat lighter-textured soils derived from sandstone and shale. The hill farmers recognize the difference between the Volusia and Wooster soils in potato

[1] Bul. 315, N. Y. Agr. Expt. Sta., Geneva, N. Y.

production, the difference being mainly in thoroughness of drainage and aeration.

In growing corn the crop is put in with a planter and cultivated several times in the season. When mature it is cut, shocked, and later husked in the field. The ears are usually stored in cribs. The roughage is fed to cattle during the winter. On farms devoted to dairying, the corn is cut before the grain matures and made into silage for winter feeding. The bean crop is also largely handled with machinery, from the planting to the thrashing. Oats and wheat are generally harvested with binders and stored in barns until thrashed. The straw is stacked in the yard, so that the stock may have access to it throughout the winter. The following season the refuse from the straw pile is hauled to the fields and plowed under. Hay is harvested by machinery and either stored in the barn or stacked.

Every successful orchard in the county is carefully trimmed and sprayed. The fruit is hand-picked and either packed in barrels on the farm or taken to commission houses in the larger towns. Damaged fruit is sold largely to the evaporators and cider presses. Commercial berry patches receive careful attention during the season, and as the fruit matures it is placed in trays and artificially dried.

In grape growing the high-renewal system of propagation is largely used. The head of the trunk is 20 to 30 inches above the ground. The trellis usually consists of three wires 18 inches apart, the lowest 20 inches above the ground. New canes are brought out of the renewal stubs, and once in two or three years an attempt is made to bring them directly from the head of the main trunk. Regular cultivation is given throughout the season. Some growers use cover crops of rye and buckwheat later in the season. The grape-leaf hopper and grapevine flea beetle are possibly the worst insect enemies, and they are not very troublesome. Fungous diseases cause more trouble, but they can be controlled.

According to the 1910 census, 35.5 per cent of the total value of farm property in Yates County is represented by buildings. The farm dwellings are substantial and are usually painted and in good repair. The barns are well suited to the requirements. The basement is fitted up for stock or for the storage of tools; the upper part contains granaries, seed rooms, and mows for the storage of hay. Smaller buildings are used for poultry and hogs and to shelter machinery. On the higher hills the buildings are smaller and in poorer condition. In good farming localities the fields are well fenced. Six and six-tenths per cent of the value of all farm property is invested in machinery. The implements in use include walking and riding plows, cultivators, mowing machines, hay loaders, binders,

and corn and bean harvesters. Several farmers own gasoline and kerosene tractors, ensilage cutters, and thrashing machines.

Horses are used almost exclusively for draft work. In 1910 there was an average of three horses to every farm. The horses are large-boned and heavy, well adapted to the type of farming.

There are many breeds of sheep represented in this county. Probably the Shropshire and Delano Merino are in the majority. On the farms devoted to dairying some purebred Holstein and Jersey animals are kept, but most of the cattle are grades of mixed breeding.

The farmers in general realize the value and necessity of proper crop rotations, and in the eastern and northern parts of the county crops are systematically rotated, but on the hill farms little attempt is made to follow a rotation. A system of rotation commonly followed on the Ontario soils and to some extent on the Wooster soils is as follows: Corn or beans the first year; beans, cabbage, or oats the second year; wheat, with timothy and clover sown, the third year; and mixed timothy and clover the fourth year. Many of the farmers mow the fields only two years, plowing under a heavy sod for the cultivated crop. The common rotation on the higher hill farms is as follows: Corn one year; oats one year; seeded to grass for four or five years; buckwheat, beans, or potatoes one year; and then back to corn. During the last few years wheat has had a place in this rotation. Fields planted to grapes and small fruit are cultivated regularly during the early season, and cover crops of rye and buckwheat are later sown.

Commercial fertilizers have been used in this county for many years, and the quantity is gradually increasing. In 1909 nearly 61 per cent of all the farmers used fertilizer, at a total cost of $57,802. Barnyard manure and rotted straw is used on nearly every farm, the manure being usually put on sod for corn or on land to be devoted to wheat. Small quantities of commercial fertilizer are distributed when the wheat is sown. Cabbages and beans often receive some commercial fertilizer. Ground limestone is not in general use.

Farm labor is scarce throughout most of the county. From $25 to $35 a month and board is paid for ordinary farm labor. Day laborers during harvest receive $2 to $3 a day. The total amount expended for labor in Yates County in 1909 was $439,260, an average of $236 for each of the 1,864 farms reporting the use of hired labor.

From 1880 to 1900 the number of farms in Yates County increased from 2,279 to 2,504, but during the last decade the total number decreased to 2,288. In 1909, 93 per cent of the total area of the county was in farms and 81.7 per cent of the farm land was improved. The average size of the farms is increasing, the average farm at present containing 89.3 acres. Of the total number of farms in the county in

1909, 1,754, or 76.7 per cent, were operated by owners, and 513, or 22.4 per cent, by tenants. Most of the tenanted farms are rented on shares.

Land values vary considerably throughout the county. The highest-priced farms are in the eastern and northeastern parts of the county, in the region of the Ontario soils, where values range from $100 to over $200 an acre. These farms usually have good buildings and include some land in fruit. Farms on the Wooster and Chenango soils are held at $50 to $150 an acre, according to location. Farms on soils of the Volusia series vary in price from $5 to $100 an acre. The valuation of farm land, aside from farms on the Ontario soils, is based upon the topography, elevation, and accessibility to shipping points and markets, rather than upon the actual producing power of the soil. Land values in Yates County are relatively high in comparison with similar types of soil of equal desirability in other parts of New York.

SOILS

Yates County is situated near the northern border of the Allegheny Plateau. This entire region was completely covered by ice during the glacial period, resulting not only in modification of the topography, but also in the deposition of a new layer of soil material from which the existing soils have been developed since the close of the glacial period.

Almost the entire region is underlain by rocks of Devonian age, the light-colored shale and sandstone of the Chemung and Portage groups. The Onondaga and Tully limestones outcrop to the north of this county, and small exposures occur throughout the northern part of the county, mainly in the deeply cut ravines.

The glacial till represented in the ground moraine mantling the uplands usually bears a close relation to the rocks over which it lies. In the lower part of the county, where the rocks are light gray in color, the soils are light-colored. The stones have very largely come from the local bedrock. The glacial débris overlying the northern and northeastern parts of the county consists of a relatively deep deposit of till which carries a considerable proportion of limestone, brought largely from farther north.

The alluvial deposits in different parts of the county vary according to the source of their material and to the drainage conditions. Where the glacial streams flowed from sandstone and shale regions the soil material is brown to yellow in color, and the gravel consists of sandstone and shale. Where the streams flowed from regions of limestone débris the soil is dark brown in color and carries a considerable percentage of limestone fragments. The recently deposited

alluvium is brown or dark brown to gray or black in color, the shade depending upon the organic content.

The soils of Yates County are classed in 10 series. The individual types having a common origin and similar color, topography, and drainage characteristics are grouped in series, the members of which differ mainly in texture. The upland till soils are classed in the Ontario, Wooster, Volusia, Allis, and Lordstown series; the soils derived from fine lake sediments in the Schoharie series; the soils from terrace and other old stream or delta deposits, now lying above overflow, in the Chenango series; and the first-bottom soils in the Holly, Genesee, and Papakating series.

The Ontario series includes soils that are brown in the surface layer and have yellowish brown or yellowish subsoil, somewhat compact but little if any heavier than the soil in texture. This series is derived from unassorted glacial deposits where a large proportion of the material is of limestone origin. Usually the substratum is distinctly calcareous, and fragments of limestone occur through the soil section. The topography is rolling and the drainage is good.

The Wooster soils are brown to grayish brown, with a yellowish tinge. The subsoils are yellowish brown. The series is derived from noncalcareous till consisting very largely of sandstone and shale material. The subsoils are no heavier than the soils in texture and are usually only slightly compacted. The substratum is distinctly porous, affording good underdrainage. The surface is rolling or very irregular and choppy.

The surface soils of the Volusia series are brownish gray to yellow, and the subsoils are pale yellow to gray, with mottlings of yellow and brown. The surface soil is friable, but the subsoil is compact and poorly oxidized. The entire 3-foot section is uniformly free from calcareous material. The Volusia soils are poorly drained.

The soils of the Allis series have been weathered from glacial till derived from local shales and sandstones. The surface soils are light-colored. The subsoil is heavily mottled and rests upon bedrock at depths varying from 18 inches to 3 feet. The Allis series differs from the Volusia mainly in the thickness of the deposit.

The surface soils of the Lordstown series are light brownish yellow, and the subsoils are light yellowish brown. The material is loose and open and free from mottling. The soils have been derived from light-colored, noncalcareous shales and sandstones laid down as a relatively thin morainic deposit. The topography is rolling to hilly.

The Schoharie series includes types having yellowish brown to brown surface soils and brownish subsoils, which may be mottled with shades of brown, red, and gray. The subsoils are as heavy as, or heavier than, the soil in texture, and calcareous. The topography

is nearly level to rolling and the drainage is good. These soils are derived from sedimentary material laid down in glacial lakes or the valleys of ancient streams, the material being of mixed origin.

The Chenango series includes types with light brown, friable surface soils and lighter brown to yellowish brown subsoils, underlain by stratified beds of sand and gravel. The material has been derived largely from noncalcareous sandstones and shales. The Chenango soils are well drained, and occupy second-bottom positions along old glacial streams or present watercourses.

The Holly series is characterized by gray surface soils and mottled gray and drab subsoils. The upper section is usually friable and the subsoil compact. The material consists of old, deep alluvium derived from light-colored shales and sandstones and laid down on terraces.

The surface soils of the Genesee series are brown, with light brown subsoils. The drainage is only fair. These soils occupy alluvial plains along streams, and are subject to overflow. The material has been derived from local sandstone formations.

The Papakating series is characterized by very dark brown to black surface soils and mottled subsoils. The material has been derived from the sandstone and shale uplands and laid down as alluvium in relatively quiet water. The drainage is very poor.

Muck consists mainly of an accumulation of organic matter laid down and decomposed under poor drainage conditions.

Rough stony land includes steep slopes along ravines where the soil-forming material is subject to variation from season to season or where the rock formations are free from any soil covering.

The following table gives the name and the actual and relative extent of each soil type mapped in Yates County:

Areas of different soils

Soil	Acres	Per cent	Soil	Acres	Per cent
Ontario loam	43,264		Lordstown silt loam	3,392	1.5
Smooth phase	1,664	20.9	Rough stony land	2,368	1.1
Shallow phase	896		Allis silt loam	1,984	.9
Volusia silt loam	34,880	17.7	Ontario gravelly fine sandy		
Flat phase	3,968		loam	1,664	.8
Lordstown stony silt loam	26,560	12.1	Volusia silty clay loam	1,024	.5
Volusia stony silt loam	18,880	8.6	Chenango gravelly fine sandy		
Wooster silt loam	15,552	7.1	loam	896	.4
Wooster gravelly silt loam	12,992	5.9	Papakating silty clay loam	896	.4
Wooster stony silt loam	12,672	5.8	Wooster fine sand	768	.3
Ontario fine sandy loam	12,608	5.7	Papakating silt loam	704	.3
Chenango gravelly silt loam	7,232	3.3	Chenango fine sandy loam	640	.3
Muck	5,184	2.4	Holly silt loam	320	.1
Schoharie silty clay	4,736	2.2			
Genesee silt loam	3,776	1.7	Total	219,520	

ONTARIO GRAVELLY FINE SANDY LOAM

The surface soil of the Ontario gravelly fine sandy loam consists of 6 or 8 inches of brown fine sandy loam, carrying a moderate amount of rounded and angular gravel and stones of limestone and sandstone. The subsoil, to 36 inches, is a light brown, gravelly, medium fine sandy loam. The lower section in places shows some stratification and cross-bedding.

This type occurs, in association with other limestone soils, in the towns of Potter, Jerusalem, Benton, Torrey, and Milo. The topography varies from rolling to rough, and is typical of kame deposits. The drainage is thorough and in some places excessive.

Approximately 75 per cent of this type is under cultivation to the general farm crops. Corn yields 25 to 35 bushels per acre, beans 10 to 18 bushels, wheat 20 to 25 bushels, and clover and timothy 1½ to 2 tons per acre. Apples and grapes do well.

Agricultural conditions are fairly good on this type. Valuations range from $75 to $125 an acre for the improved areas.

ONTARIO FINE SANDY LOAM

The Ontario fine sandy loam to a depth of 8 or 10 inches consists of a brown fine sandy loam carrying a small percentage of both waterworn and angular fragments of sandstone and limestone. The subsoil, to 36 inches, is a light brown to yellowish brown fine sandy loam, containing bowlders very largely of limestone. The surface soil is mellow and open, while the subsoil is relatively compact, though thoroughly oxidized. The texture of this type as mapped varies from a fine sandy loam to a very fine sandy loam or light loam.

The Ontario fine sandy loam occurs in the northeastern part of the county, the largest areas being mapped in the towns of Benton, Torrey, and Potter. It occupies ridges along slopes and at the heads of valleys. The topography varies from undulating to rolling, ranging to rough and morainic. The natural drainage is usually adequate. Much of the type has been underdrained. The compact subsoil tends to store sufficient quantities of moisture for the best plant development.

This soil was originally forested with a heavy stand of black walnut, chestnut, oak, and other hardwoods. This has been cleared off, and about 80 per cent of the type is under cultivation at the present time. The most important crops grown are corn, beans, cabbage, wheat, oats, and fruit. Corn yields 35 to 60 bushels per acre and a good tonnage of stover. Beans do well, yielding 18 to 20 bushels per acre. The soil is particularly well adapted to the growing of winter wheat, which yields 25 to 40 bushels per acre. Oats also do well,

yields of 45 to 50 bushels per acre being reported. Cabbage is an important cash crop, yielding 18 to 20 tons per acre. A small acreage is devoted to grapes. Apples, plums, pears, peaches, and cherries are extensively grown. The roughest areas are best suited to forestry.

This soil is handled in much the same way as the Ontario loam. Only a small quantity of stock is kept, usually consisting of a few cows, a small flock of sheep, a few hogs, and the necessary work horses.

Agricultural conditions in general are good on the Ontario fine sandy loam. The buildings are modern and commodious, and the fields are well fenced. Land values range from $75 to $200 an acre. Very few farms are changing hands.

ONTARIO LOAM

The Ontario loam to a depth of 8 or 9 inches is brown in color and a friable, light loam to heavy fine sandy loam in texture. It usually contains a moderate quantity of relatively small, angular fragments of sandstone and limestone. The subsoil to a depth of 36 inches is lighter in color than the surface soil, being brown to light brown or yellowish brown. It consists of a loam which usually is noticeably more compact than the surface soil, but varies somewhat, from heavy to light. The subsoil contains many angular and partially rounded stones and gravel of sandstone and limestone, among which limestone usually predominates. Much of this soil type carries a high percentage of limestone fragments, and is closely related to the soils mapped as Honeoye in the eastern part of the State.

Variations in texture occur in this type in the large areas bordering Seneca Lake 2 miles south of Dresden, where the soil in numerous patches varying in size from a few square feet to two or three acres ranges in texture from a fine sandy loam to silty clay. The soil usually consists of 4 to 12 inches of light brown, light-textured loam underlain by heavy, plastic, chocolate-colored silty clay or clay. The surface soil carries a moderate amount of sandstone fragments, and the subsoil contains varying quantities of limestone fragments of all sizes.

The Ontario loam is one of the most important soil types in this region. It is extensively developed in a belt extending across the northern part of the county, especially in the towns of Milo, Torrey, Benton, Potter, and Middlesex. The surface is undulating to gently rolling, sometimes varying to low, elongated hills or ridges with rounded slopes. Near Penn Yan the type extends to some of the steep slopes. There is no difficulty in using farm machinery except on the steepest slopes. Natural drainage over this type is prevailingly only

fair, owing principally to the compactness of the lower subsoil. It is estimated that more than 75 per cent of the type has been tile-drained.

Agricultural conditions on the Ontario loam are above the average for the State. Eighty to ninety per cent of this soil type is cleared and under cultivation. The original timber consisted of black walnut, red oak, and white pine. Canadian and Kentucky bluegrass grow naturally and form the chief part of the older sods.

The most important crops grown are corn, beans, wheat, oats, and hay. Apples are the principal fruit, with smaller acreages devoted to pears, plums, and peaches. Corn is grown mainly for the grain, and yields 35 to 60 bushels per acre, with an average of about 40 bushels. The red kidney bean is generally grown on this soil, and yields 15 to 20 bushels per acre. The soil is well adapted to wheat, of which a large acreage is sown annually. Yields range from 25 to 35 bushels per acre. Oats yield 35 to 60 bushels per acre. Hay is an important crop on this soil. The first season clover usually cuts 2 tons or more per acre, and the second year a good quality of timothy and clover mixed yields 1½ to 2 tons per acre. Some cabbage is grown, yielding 15 to 20 tons per acre. The acreage devoted to alfalfa is being extended. Most of the steeply sloping areas along Keuka Lake are used for the production of grapes.

This is one of the best-farmed soils in the county. Most of it has been improved by underdrainage, and systematic rotations are practiced. A common rotation consists of corn or beans the first year, followed by beans, cabbage, or oats the second year, and wheat, clover, and timothy seeded the third year. The sod is left for 2 years. Stable manure is applied to sod to be plowed for corn, and small quantities of commercial fertilizer are used on cabbage and wheat.

Land values on the Ontario loam depend largely upon the location, state of cultivation, fruit plantings, and buildings. Very few farms are for sale for less than $100 an acre, and most of them are held at $125 to $200 an acre. The roughest areas used for pasture are valued at $10 to $30 an acre, the areas in timber at $25 to $60 an acre, and grape lands at $150 to $300 an acre.

Ontario loam, smooth phase.—The smooth phase of the Ontario loam consists of a brown to dark brown loam, with a depth of 6 to 10 inches, underlain by a subsoil of light brown to yellowish brown, compact loam. A small quantity of limestone and sandstone fragments occurs on the surface and throughout the soil section. Occasional glacial bowlders of rocks foreign to this region are scattered over the surface. The surface soil is uniformly darker and more silty than that of the typical Ontario loam.

The smooth phase occurs throughout the more gently undulating region in the northeastern part of the county, principally in the

towns of Torrey and Benton. It is developed along stream heads and in depressions where drainage is slow or entirely lacking.

The phase is not extensive, and it is of little importance. Only a very small percentage is under cultivation, the remainder being used as pasture or woodland. The timber growth consists of soft maple, elm, and white ash. In its present condition the phase is probably being utilized to the best advantage.

Ontario loam, shallow phase.—The shallow phase of the Ontario loam has a brown, light loam surface soil, of an average depth of 8 inches, underlain by light brown or yellowish brown, compact loam, which rests upon bedrock of fine-grained sandstone and shale at depths varying from 18 inches to 3 feet. In the surface soil small angular sandstone fragments predominate, but in the subsoil most of the fragments are of limestone.

This phase is encountered in the towns of Benton and Torrey, and occurs where the uplands break into the slope to Seneca Lake. The surface is usually undulating, with a moderate slope. The surface drainage is fairly well developed, but the internal movement of moisture is poor, owing to the compact structure and the nearness to bedrock. Crops often suffer during protracted periods of rain or drought.

Agriculture is fairly well developed in this phase. Practically the same crops are grown as on the deeper soils, but the yields are slightly lower.

The following table shows the results of the mechanical analyses of samples of the soil and subsoil of the Ontario loam:

Mechanical analyses of Ontario loam

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
162447............	Soil.........	2.0	4.0	3.3	19.4	22.6	34.1	14.5
162448............	Subsoil......	1.8	3.7	3.3	20.0	22.8	28.1	20.2

WOOSTER STONY SILT LOAM

The Wooster stony silt loam consists of 5 or 7 inches of brown to light brown, mellow, stony silt loam, underlain to 36 inches or more by a yellowish brown to yellow, stony silt loam. The entire 3-foot section is friable and well oxidized. Both soil and subsoil carry a variable but usually large quantity of small, angular, flat fragments of sandstone and a few large bowlders of foreign origin. In places the soil approaches a loam in texture, containing much fine sand and very fine sand.

The Wooster stony silt loam occurs in the more rolling and rougher areas throughout the uplands. It is typically developed in the towns of Jerusalem, Italy, and Potter, and in smaller areas in other towns. The topography is rolling to hilly, and fields are cut up by the relatively deep channels of small intermittent streams. Part of the type includes rough, morainic areas. The drainage is usually good.

The original forest growth on this soil has practically all been removed. It consisted chiefly of white pine, oak, chestnut, and hard maple. The present stand consists of second and third growth oak, maple, chestnut, and white pine. Approximately 60 per cent of the type is in timber or permanent pasture. Agricultural conditions are only fair over most of the Wooster stony silt loam. Oats, buckwheat, hay, and beans are the principal crops grown. Dairying is carried on in a small way. A considerable number of sheep and a few hogs are raised.

Oats yield 20 to 35 bushels per acre; buckwheat, 15 to 20 bushels; hay, 1 ton; beans, 10 to 16 bushels; and potatoes, 125 to 150 bushels per acre. Fields are often left in sod too long, resulting in decreased productiveness of the soil and a lowering in the quality of the hay. Very little commercial fertilizer is used on this soil.

Land values vary widely on the Wooster stony silt loam. Farms with buildings in good condition and fields in fair cultivation, with little waste land, sell for $75 to $90 an acre, but much of the type can be bought at lower prices.

Farms on this soil can be greatly improved by keeping more live stock and selling less hay. Systematic, shorter rotations should be followed and some form of lime should be used. Many of the farm woodlots could be improved and put on a paying basis by cutting out the dead timber and less desirable undergrowth.

WOOSTER GRAVELLY SILT LOAM

The Wooster gravelly silt loam consists of a light brown to dark yellowish brown gravelly silt loam, 6 or 8 inches deep, resting upon a subsoil of brownish yellow gravelly silt loam, 36 inches or more in depth. The whole 3-foot section is more or less filled with water-worn, rounded, and flat, angular fragments of sandstone and other calcareous rocks.

The texture and the percentage of gravel from place to place are variable. The soil in many places grades toward a loam or even a fine sandy loam. In one small area three-fourths of a mile northwest of Guyunoga and another 2 miles southwest of Italy the soil is distinctly sandy, consisting of a brown gravelly fine sandy loam underlain by a yellowish brown gravelly fine sandy loam.

The Wooster gravelly silt loam occurs in areas of relatively rough morainic deposits through the valleys and to a less extent in the

uplands. It is most extensively and typically developed in the southwest corner of Italy Town. Smaller areas are mapped in every town in the county except Torrey. The topography varies from rolling to hummocky and ridgy. In many places the surface is marked with small kettleholes. The drainage is good to excessive. The slope is sufficient to cause adequate run-off, and the deep semi-stratified substratum gives thorough underdrainage.

Approximately 50 per cent of this type is under cultivation. It is devoted to general farm crops, and apples, grapes, and small fruits. Yields vary with the topography and methods of cultivation. Beans yield 10 to 15 bushels per acre, potatoes 125 to 150 bushels, oats 25 to 50 bushels, and hay 1 to 1½ tons.

WOOSTER FINE SAND

The Wooster fine sand to a depth of about 6 inches consists of a light brown to yellowish brown very fine sand or loamy fine sand. The subsoil, to 36 inches, is a yellowish brown to dull yellow fine sand. The texture of the type tends toward a very fine sand rather than a medium sand.

The Wooster fine sand is not extensive in Yates County. The largest area occurs immediately southeast of Friend. Smaller areas occur, in conjunction with types derived from limestone drift, in the towns of Potter and Benton. The topography is rolling to rough and hummocky, and drainage is apt to be excessive.

The smoother areas of this type are under cultivation to corn, oats, wheat, and hay. Truck crops are grown to some extent and give fair yields.

Land values vary according to the location with respect to markets, the topography, and the state of cultivation.

Cultivated fields on the Wooster fine sand should be so cropped as to increase the supply of organic matter, giving the soil greater power to conserve moisture and improving the tilth.

The following table shows the results of the mechanical analyses of samples of the soil and subsoil of the Wooster fine sand:

Mechanical analyses of Wooster fine sand

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
162451	Soil	2.5	6.5	6.1	37.0	28.5	13.6	5.7
162452	Subsoil	1.8	4.9	4.0	37.5	35.5	11.4	4.8

WOOSTER SILT LOAM

The surface soil of the Wooster silt loam consists of 7 or 8 inches of friable silt loam, deep brown or yellowish brown when moist. The subsoil, to a depth of 36 inches, is a more compact, though well-

oxidized, yellowish brown silt loam. The entire 3-foot section is free from mottling, in contrast to the Volusia soils. A small quantity of angular sandstone fragments and occasional glacial erratics are scattered over the surface and throughout the subsoil. In places the texture varies toward a loam.

The Wooster silt loam is extensively developed throughout the uplands, occurring in areas of deep till derived from sandstone and shale. It ranges in elevation from 800 to 1,800 feet above sea level. The type is mapped in every township in the county except Torrey. The most extensive areas occur in Starkey, Milo, Jerusalem, and Potter towns.

The topography varies from undulating to rolling. Practically all the Wooster silt loam can be worked with machinery. The natural slope and open structure of the soil and subsoil permit thorough drainage. A few areas deficient in natural drainage have been tile-drained.

This soil was originally covered with a heavy stand of white pine, oak, and chestnut. The present forests are of second and third growth, principally oak, chestnut, and maple. Canada bluegrass predominates in the meadows.

Agricultural conditions on this soil are in general good. The farms range from among the best in the county to the poorest. Approximately 75 per cent of the type is under cultivation. Corn, oats, wheat, buckwheat, beans, and hay are the principal crops. Dairy farming is carried on to some extent. The milk is usually made into butter on the farm. Many sheep and a few steers are kept.

Corn for grain does well in areas at the lower elevations, yielding 30 to 45 bushels, or 8 to 12 tons of ensilage, per acre. Oats ordinarily yield about 35 bushels per acre, wheat 20 to 25 bushels, buckwheat 25 to 35 bushels, beans 12 to 18 bushels, and hay about 1 ton. Alfalfa is grown with success on some farms. Potatoes do well, yielding 150 to 200 bushels per acre. Apples and small fruits give good yields. Some very successful vineyards have been established in the vicinity of Branchport.

A rotation in common use consists of corn or beans the first year; oats, beans, or potatoes the second year; and wheat, with timothy and clover seeded, the third year. The sod is left two years or more. Stable manure is usually applied to sod to be used for corn, and commercial fertilizers are applied on corn and wheat. Modern machinery is generally used on this type.

Land values on the Wooster silt loam are relatively high, ranging from $45 to $125 an acre. Probably most of the type is held at $75 to $90 an acre.

Agricultural conditions on the Wooster silt loam could be improved by raising more cattle and sheep. The soil could be made more productive by the application of some form of ground limestone at least once in every rotation.

VOLUSIA STONY SILT LOAM

The Volusia stony silt loam to a depth of 6 to 8 inches is a light yellow to grayish brown, stony silt loam. The subsoil, to 36 inches, is a light yellow to gray, compact stony silt loam, mottled with orange, yellow, and brown. Stones are comparatively abundant on the surface and throughout the 3-foot section. They consist of fine-grained sandstone, and vary in size from small angular chips to slabs 6 or 12 inches across. There is sufficient stone to interfere to a greater or less extent with the best use of farm machinery.

This type is widely distributed throughout the upland, but it occurs principally in the high, rolling country throughout the towns of Starkey, Barrington, Jerusalem, Italy, Middlesex, and Potter. The surface is rolling to hilly, but most of the type can be worked with farm machinery. The close, dense structure of the subsoil prevents free internal movement of soil moisture, and the type as a whole is inadequately drained.

The Volusia stony silt loam was originally timbered with maple, beech, white pine, birch, and wild cherry. This has largely been cut over, and the present wooded areas support a poor growth of the same trees. Some of the cultivated areas have been partially abandoned, and are covered with briers, goldenrod, and other weeds.

Farms on this soil are devoted to general farming. Hay is the principal crop. Small numbers of cattle and sheep roam the fields at will. Many of the farms are run down, the buildings being in poor condition, many of the fences being entirely gone, and the fields grown up in weeds and briers. A few farms are in a fair state of cultivation and on these the principal crops grown are hay, oats, buckwheat, and beans. Hay yields one-half to 1½ tons per acre, oats 25 to 30 bushels, buckwheat 18 to 25 bushels, and yellow-eye beans 10 or 12 bushels. Most of the hay and all the beans produced are sold.

Farms on this soil could be improved by installing better drainage, applying lime, rotating crops, and raising more live stock.

VOLUSIA SILT LOAM

The surface soil of the Volusia silt loam is a friable, brownish gray silt loam, 6 to 8 inches deep. The subsoil, to a depth of 36 inches, is a light yellow to grayish brown, compact silt loam. The

subsoil is always mottled with brown, yellow, drab, or gray, the intensity of mottling varying from place to place. Both soil and subsoil contain a moderate amount of relatively small angular fragments of sandstone and shale, as well as a few large glacial bowlders of foreign origin. Some included small areas, mostly of rough topography, really represent the stony silt loam.

The Volusia silt loam is extensively developed throughout the uplands underlain by sandstone and shale. It has a range in elevation of over 1,300 feet within the county. The largest areas are encountered in the townships of Barrington and Jerusalem, but the type is developed to some extent in every township in the county.

The surface is undulating to rolling, with relatively smooth slopes. Farm machinery can be used on practically all the type. The surface drainage is fair, but the compact subsoil holds moisture, and the type as a whole is poorly drained. Artificial drainage is necessary over a large proportion of its area.

The original timber growth on this soil consisted of sugar maple, beech, white pine, basswood, and ash. Practically all the virgin stand has been removed. Large areas were cleared, cultivated for a few years, and then abandoned. These areas afford some scant pasturage at present.

The Volusia silt loam is devoted to general farming, dairying, and sheep husbandry. It supports a large number of small orchards and vineyards, only a few of which receive any tillage throughout the season. Probably the most important crop grown is hay, largely timothy and redtop. Yields range from one-half to 1½ tons per acre, according to the age and condition of the sod. Some alsike clover, which does best on a wet, acid soil, is grown. Buckwheat yields 20 to 25 bushels per acre, oats 25 to 35 bushels, and beans of the yellow-eye variety 10 to 18 bushels.

A small number of cattle are kept, the milk being made into butter at home or taken to a factory.

Only a very small proportion of the Volusia silt loam is handled in a systematic, profitable manner. In many cases crops are grown to which the soil is not adapted. No systematic rotation of crops is practiced, and the tillage methods are inefficient. Sods are left until they no longer produce, and many fields have been allowed to grow up to briers and weeds. The buildings are generally run down, and fences are often lacking. Very little live stock is kept, and most of the hay is sold, with the result that the organic matter in the soil has been, or is being, largely depleted. This is the so-called "abandoned-farm" soil of southern New York.

Land values on this type range from $15 to $100 an acre. The lowest-priced land is usually quite remote from good highways and lacks buildings. The higher valuations prevail in areas contiguous to better soil.

To improve the Volusia silt loam it is necessary to build up the organic content of the soil by rotating crops and keeping more live stock. The soil needs better drainage, and its productiveness could be increased by the use of lime and thorough cultivation.

Volusia silt loam, flat phase.—The surface soil of the flat phase of the Volusia silt loam is a light yellowish brown to yellowish gray, mellow silt loam, with an average depth of 6 or 8 inches. The subsoil from 8 to 24 inches is a light yellow to dull gray, compact silt loam, invariably mottled with yellow and brown. From 24 to 36 inches or more the material is a gray or drab silty clay loam, heavily mottled. There is usually a small percentage of angular and partially rounded fragments of local sandstone and foreign bowlders scattered over the surface and throughout the 3-foot section.

This phase occurs in the southern part of the county. The largest area is mapped north of Himrod. Smaller areas are scattered throughout the county. The surface is undulating to nearly level, with occasional ridges lying 2 or 3 feet above the surrounding land. Natural drainage is poor, owing to the slight slope and the heavy character of the subsoil.

The flat phase of the Volusia silt loam is not important agriculturally. Approximately 60 per cent of it is used for permanent pasture or is thinly covered with elm, soft maple, beech, and ash. Areas under cultivation are devoted to oats, corn, buckwheat, and hay. Land values range from $10 to $75 an acre. This soil requires artificial drainage and the addition of some form of lime. It seems to be best suited to the production of hay and to use as pasture land.

VOLUSIA SILTY CLAY LOAM

The Volusia silty clay loam has a surface soil of about 6 inches of grayish brown to yellowish brown, heavy silt loam or silty clay loam. The subsoil is a dense, compact silty clay, pale yellow to gray in color and mottled with brown and yellow. A few small angular fragments of sandstone and foreign rocks are scattered over the surface and throughout the soil mass.

The largest area of this type occurs about 3 miles north of Himrod. Smaller areas are mapped throughout the uplands, especially in the towns of Starkey, Barrington, Milo, and Jerusalem. Owing to the gently undulating to nearly level surface and the compact internal structure the type does not have adequate drainage.

This is not an important type agriculturally. Part of it supports a poor stand of elm, basswood, and soft maple. The type is largely used as pasture and hay land. Buckwheat and beans are grown in a small way. Hay is probably the crop best suited to the soil, the yields ranging from three-fourths ton to 1½ tons per acre.

Agricultural conditions over the Volusia silty clay loam in Yates County are poor and land valuations apparently are disproportionately high. The type requires drainage and the liberal use of lime for successful farming.

The following table shows the results of the mechanical analyses of samples of the soil and subsoil of the Volusia silty clay loam:

Mechanical analyses of Volusia silty clay loam

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
162421	Soil	1.7	3.0	1.3	4.3	8.6	50.4	30.6
162422	Subsoil	.7	1.4	.6	2.3	9.6	47.6	37.8

ALLIS SILT LOAM

The surface soil of the Allis silt loam is a light yellowish brown, mellow silt loam, 4 to 6 inches in depth, overlying a subsoil of light yellow to gray silt loam which rests at depths of 15 to 24 inches upon fine-grained sandstone. The subsoil is invariably mottled with brown, yellow, or gray. In general both soil and subsoil contain only a moderate quantity of small angular stone fragments, but in a few areas the type is quite stony. These stony areas are shown on the map by symbol.

The Allis silt loam is most extensively and typically developed in the town of Milo, with smaller areas in the towns of Jerusalem and Middlesex. It occurs as partially residual glacial till overlying non-calcareous shale and sandstone at shallow depths.

The topography is rolling to hilly. The large area east of Himrod has a gentle slope toward the lake. The small area in the northwest corner of the town of Middlesex occupies a very steep slope.

The natural drainage in general is inadequate. The slope is usually sufficient to insure good run-off, but the heavy subsoil and the shallowness of the soil mantle, with springs seeping out along the bedding planes of the rock, render the type wet and cold during much of the year unless underdrained.

Practically all of the Allis silt loam has been cleared. A small proportion is grown up to a poor stand of scrub timber and brush. A larger percentage is used as pasture or hay land. The area bordering Seneca Lake is devoted to general farming and fruit production. Grapes and berries do well where the soil has been improved by underdrainage. Agricultural conditions on this soil range from fair to poor. Land values depend upon the location, state of cultivation, and the value of adjoining property.

LORDSTOWN STONY SILT LOAM

To an average depth of 6 inches the surface soil of the Lordstown stony silt loam is a light brown to yellowish brown, stony silt loam. The subsoil is a yellowish brown to yellow, stony silt loam. This is essentially a shallow-till soil, the depth of the till mantle varying from 12 inches to as much as 4 or 5 feet. This type is characterized by a high stone content both in the surface layer and throughout the soil mass. The stones are usually small; they do not seriously interfere with cultivation. The boundary drawn between the deeper areas of the Lordstown soil and the shallower areas of the Wooster soils is necessarily arbitrary.

The Lordstown stony silt loam occurs bordering the narrow, deep valleys throughout the uplands. Its greatest development is along Canandaigua, Seneca, and Keuka Lakes and along the glacial valleys extending through Middlesex and Italy Hollow; also along the Big Stream Valley and its tributaries in the southeastern part of the county. The slopes are all steep, some of them having a grade of 800 to 1,000 feet to the mile. Farm machinery can be used in few places with any satisfaction. In the vineyards sleds are used to move the fruit down the slopes. Drainage is often excessive, owing to the open structure of the soil and the steepness of the slopes.

Most of the original growth of chestnut, oak, white pine, and maple has been removed. A large proportion of the type is now covered with a mixed second or third growth of maple, pine, hemlock, oak, and similar trees, usually of low quality. Part of the type that was cleared and cultivated has been abandoned and now supports a growth of brush and weeds.

Along Keuka Lake, and to a less extent along Canandaigua Lake, the Lordstown stony silt loam is used principally for viticulture. The climatic conditions here are most favorable to grape culture. The more important varieties grown are the Concord, Delaware, and Catawba. Yields range from 2 to 3 tons per acre, depending upon the variety, the season, and the condition of the vines. The vineyards usually receive thorough cultivation throughout the growing season, but in a few cases cover crops are grown. Some farmers use commercial fertilizers and others stable manure, while many do not use any fertilizer.

LORDSTOWN SILT LOAM

The surface soil of the Lordstown silt loam is a light brown mellow silt loam of an average depth of 6 or 8 inches. The subsoil is a yellowish brown to bright brownish yellow friable silt loam, resting upon sandstone and shale bedrock or masses of shattered rock at shallow depths, usually less than 3 feet. The entire 3-foot

section usually contains a small percentage of small angular fragments of sandstone.

The Lordstown silt loam is not an extensive soil in Yates County. It occurs in the towns of Starkey, Milo, Torrey, Jerusalem, and Barrington. The largest areas are mapped north of Shannon Corners and south of Dresden, in the eastern part of the county. The surface is undulating to rolling, with few slopes too steep for cultivation. The run-off is good, and the mellow surface soil and relatively open subsoil permit of free internal movement of moisture.

Originally a heavy forest of white pine, oak, chestnut, and maple covered this soil. This has largely been cleared off and the land put into cultivation. Corn, beans, oats, wheat, buckwheat, and hay are the principal crops grown. Grapes, raspberries, apples, plums, pears, and cherries are grown to some extent and give fair yields. A few head of cattle, sheep, and hogs are kept on nearly every farm.

Corn yields 25 to 35 bushels per acre, beans 10 to 12 bushels, oats 25 to 45 bushels, wheat 20 to 25 bushels, buckwheat 20 to 25 bushels, and mixed hay 1 to 1¼ tons. The soil is handled in about the same manner as the adjacent types. Some sort of a rotation is practiced more or less systematically. The hay lands are mowed for three to five years. Very little, if any, lime is used, and only a small amount of commercial fertilizer is applied on beans and wheat. Beans, wheat, and hay are the main cash crops. Some butter is made on the farm and sold on the local markets.

Land values on the Lordstown silt loam vary according to the location, the state of cultivation, and the acreage of fruit in bearing. From $35 to $100 an acre is asked for farms on this soil. Few farms are changing hands.

Agricultural conditions prevailing over this soil are only fair to poor. The buildings are in a fair state of repair, but the fences are poor. Fields are left in sod too long, resulting in a poor quality of hay and in a decrease in yields. This soil in general needs more organic matter, which can be added by plowing under stable manure or cover crops or by turning under a good sod. Liming should prove beneficial. The more extensive raising of live stock, to consume roughage from the crops, would apparently be profitable.

SCHOHARIE SILTY CLAY

The Schoharie silty clay, to a depth of 6 or 8 inches, is a brown to grayish brown, heavy silt loam to silty clay. The subsoil to 36 inches is a heavy, tenacious silty clay, of a brown to light chocolate brown color. Small fragments of glacial erratics and of sandstone and limestone are often scattered over the surface and occasional fragments may be found in the soil section. In some places the

loamy soil layer is lacking, the entire 3-foot section being a heavy clay in texture. In a few areas the soil rests upon shale at depths of 20 inches to 3 feet.

The Schoharie silty clay is most extensively and typically developed east of the New York Central Railroad, in the vicinity of Himrod. Smaller areas are mapped along Seneca Lake north of Dresden, and in the vicinity of Keuka Park, and in other sections of the upland, in association with the limestone-till soils.

The surface is undulating to gently rolling, the areas often being cut through by narrow ravines traversed by small streams. The substratum in such cuts is seen to be largely made up of massive limestone bowlders. The subsoil at depths of 2 feet or more usually gives a calcareous reaction.

The gently undulating topography and the fine texture and dense structure of the soil retard the free movement of water, and the type consequently is rather cold and poorly drained. Much of it has been improved with tile drainage.

A large proportion of the Schoharie silty clay is under cultivation. Corn, oats, wheat, and hay are the principal crops grown. Corn yields 35 to 50 bushels per acre, oats 30 to 50 bushels, wheat 20 to 25 bushels, and hay 1½ to 2 tons. There are some thriving fields of alfalfa on this soil, and the question of drainage is the only limiting factor in the growing of this legume. Some apples and grapes are grown, with fairly good success.

Agricultural conditions over the Schoharie silty clay are only fair. Land values range from $60 to $100 or more an acre, varying with the location and the acreage devoted to fruit. Very few farms are changing hands.

CHENANGO GRAVELLY FINE SANDY LOAM

The Chenango gravelly fine sandy loam to a depth of 6 to 8 inches is a light brown to brown, gravelly fine sandy loam. To a depth of 36 inches the subsoil is a light brown to yellowish brown, gravelly fine sandy loam. Where typically developed the type contains 15 to 35 per cent of small, rounded gravel and angular fragments of sandstone and foreign rocks on the surface and throughout the entire 3-foot section. The interstitial material varies from a fine sandy loam to a medium sand. In some areas gravel may be lacking, but these are included on account of their small extent.

The Chenango gravelly fine sandy loam occurs in small scattered areas along Big Stream, 2 miles north of Penn Yan, and in other parts of the county. Its surface is nearly level, the type occupying terraces or benches, but it is well drained. In the area at Dresden the soil differs from typical in carrying a considerable proportion

of limestone gravel. It is really the Fox silt loam, but it is not extensive enough to recognize as a separate type.

The Chenango gravelly fine sandy loam was originally forested with white pine, chestnut, oak, and hemlock. This has been cleared off, and the soil is cultivated to general farm crops. In a few areas it is low in organic matter.

Agriculture is well developed on this soil. Corn, oats, wheat, beans, alfalfa, and hay are grown with success. The type is well suited to the production of fruits, especially apples, pears, raspberries, and strawberries.

Land values on this soil vary with the location, accessibility to markets, condition of buildings, extent of tillable land, and state of cultivation.

CHENANGO GRAVELLY SILT LOAM

To a depth of 8 inches the Chenango gravelly silt loam is a light brown to light yellowish brown, gravelly silt loam. The subsoil, to a depth of 36 inches or more, is a yellow, gravelly silt loam. In places the texture ranges to coarse. The gravel consists of both waterworn and angular fragments of sandstone and shale. In some places the type contains cobbles. Below the 3-foot section the material consists of stratified beds of sand, silt, and gravel. The area immediately west of Himrod, extending in a southerly direction, contains a larger percentage of small, partially weathered fragments of light-colored shale on the surface and throughout the entire 3-foot section. In some small areas the type varies in having a very dark brown surface soil and a lighter-colored subsoil. Other areas usually occurring at the mouths of small streams issuing from the uplands are both gravelly and stony, large fragments of sandstone and shale being abundant on the surface and throughout the soil section.

The Chenango gravelly silt loam is comparatively extensive throughout the valleys in the sandstone region of Yates County. The largest area is a strip extending from Himrod southward through Dundee to Rock Stream. Smaller, though extensive, areas occur along most of the larger and some of the smaller streams of the county. The type occupies terraces and alluvial fans deposited at their mouths by swiftly moving streams of glacial times, and its surface is gently undulating to rolling. Owing to the mellow condition of the surface soil and the open structure of the subsoil, the drainage is good.

The original forest growth on this soil consisted of maple, white pine, hemlock, chestnut, and oak. This has largely been cut off and the soil brought under cultivation. Corn, beans, oats, and hay are the leading crops. Grapes, raspberries, strawberries, apples, pears, and plums are grown to a considerable extent. Dairying and sheep raising are carried on by some farmers.

Corn ordinarily yields 25 to 35 bushels per acre, beans 10 to 15 bushels, oats 30 to 35 bushels, and hay about 1 ton. All the fruits grown return good yields. The milk produced is either taken to creameries or made into butter on the farm.

Agricultural conditions on the Chenango gravelly silt loam are prevailingly good. Systematic crop rotations are usually practiced, the tillage is thorough, and the stable manure produced is generally returned to the soil. The vineyards and orchards receive careful attention in both cultivation and spraying. The buildings are adequate, and they are generally kept in good repair. Good fences are maintained.

Land values depend largely upon the location, the character of the adjacent soils, the state of cultivation, and the acreage devoted to fruit. Farms located principally on this type range in selling value from $45 to $100 an acre.

CHENANGO FINE SANDY LOAM

The surface soil of the Chenango fine sandy loam is a light brown fine sandy loam, with a depth of 7 to 9 inches. The subsoil to 36 inches is a yellowish brown fine sandy loam. The entire 3-foot section is uniformly free from stone. Deposits of stratified clay are often discernible in road cuts, at depths ranging from 3 to 6 feet below the surface.

The Chenango fine sandy loam occurs in the southeastern corner of the county. It is of very small extent. The topography is gently undulating to rolling, with occasional ridges resembling the remains of cut-down terraces. The drainage ranges from good to rather excessive.

This type has largely been cleared and planted to apples, peaches, or grapes, or put under cultivation to general farm crops. Yields are about the same as those obtained on adjacent types.

HOLLY SILT LOAM

The Holly silt loam consists of 6 or 8 inches of brownish gray, mellow silt loam, underlain by a subsoil of gray or drab to yellowish gray, heavy silt loam, invariably mottled with yellow and rusty brown. The lower subsoil from 30 to 36 inches is often a heavy, tenacious silty clay or clay. The surface and the entire 3-foot section are uniformly free from gravel and stone. Variations from the typical are encountered in small, poorly drained areas where the material approaches that of the Papakating types, or on low, narrow ridges where the 3-foot section is less mottled, the type here approaching the Chenango series in characteristics. These areas were too small to warrant separation on the map.

While the Holly silt loam is typically developed in Yates County it is not extensive, occurring only in the southern part of the county along Big Stream and Fivemile Creek, in the towns of Barrington and Jerusalem, respectively.

The surface ranges from very gently undulating to level. The type is an alluvial first-bottom soil, subject to overflow in seasons of high water. Very little deposition is going on at the present time, however. The drainage is naturally poor.

Practically all this type has been cleared, and it is used largely for pasturage. Hay is the most extensively grown and the most dependable crop. Occasionally oats, buckwheat, corn, and beans are grown, but the risk of loss during a wet season makes it impracticable to follow a systematic rotation. The hay produced is largely timothy and yields 1½ to 2½ tons per acre.

Land values vary widely on this type. Some farms are held at prices as low as $15 an acre, and some as high as $90 an acre.

In general, this soil needs underdrainage and applications of lime.

GENESEE SILT LOAM

The Genesee silt loam to a depth of 8 or 10 inches is a brown to grayish brown, mellow silt loam, underlain to a depth of 36 inches or more by a light brown to grayish brown, compact silt loam, mottled with yellow and rusty brown. The mottlings are more pronounced in the more poorly drained areas. A small percentage of rounded gravel and waterworn shale fragments is sometimes encountered on the surface and throughout the lower section, especially in the smaller areas. Some small scattered areas are quite shaly. The color of the surface soil is variable in some of the larger areas, depending upon the drainage and the organic-matter content.

The Genesee silt loam occurs in numerous areas scattered throughout Yates County, particularly along the bottoms north from Branchport and along Flint Creek, West River, Nettle Valley Creek, and smaller streams throughout the uplands. The surface is level to gently undulating. The type occurs in first-bottom positions where it is subject to overflow during periods of high water, and where it receives seepage from the bordering hills during part of the year. A small proportion of it is fairly well drained during at least part of the season.

This type was originally covered with ash, elm, soft maple, and pine. This has all been cut over several times, and the present tree growth is light and of poor quality. The soil is best adapted to use as hay and pasture land, and it is largely devoted to these uses. Sods are usually left for long periods and yield 1 to 2 or more tons of hay per acre.

PAPAKATING SILT LOAM

The Papakating silt loam consists of a dark grayish brown to black silt loam, 4 to 10 inches deep, underlain to 3 feet or more by a grayish brown to drab, heavy silt loam, mottled with brown and yellow. The type is relatively free from gravel and stones. In some places the surface soil is lighter-colored than typical, the type here resembling the Genesee soils. In other places a layer of Muck 1 to 4 inches in thickness covers the surface.

The Papakating silt loam is not an extensive soil in Yates County. The largest area is mapped near Benton. Smaller areas occur in the towns of Benton and Milo. The type usually occupies first-bottom positions along streams, but a few areas are mapped in basin-like depressions throughout the upland. The surface is nearly level and drainage is uniformly poor.

A large proportion of this type is grown up to scrub timber and brush. Some of it is used for pasture. A very small percentage has been improved with internal drainage and is cultivated to general farm crops, principally beans, corn, cabbage, beets, grain, and hay.

PAPAKATING SILTY CLAY LOAM

The surface soil of the Papakating silty clay loam is a dark brown or dark grayish brown to black, heavy silt loam to silty clay loam, with an average depth of 5 to 7 inches. The subsoil is a grayish brown to drab silty clay, usually mottled with yellow and dull brown. Scarcely any stone or gravel occurs in this type. Variations in the surface-soil color are due largely to differences in the organic-matter content.

The Papakating silty clay loam is most extensively developed in the western part of the county, along Flint Creek and West River and their tributaries. Smaller patches are scattered throughout the uplands. The surface is nearly flat, and most of the larger areas are wet during the greater part of the year. The flat surface and the heavy texture and impervious structure of the subsoil hinder the free circulation of soil moisture, and the type is poorly drained.

The timber growth on this soil consists principally of ash, elm, poplar, soft maple, and alder. In some places it supports a luxuriant growth of flags, sedges, rushes, and other water-loving plants. Some hay is cut from the drier areas, and some pasturage is obtained. In its present condition the agricultural value of this type is low, and very little of it is farmed. When drained it should produce good crops of hay and grain.

The following table shows the results of the mechanical analyses of samples of the soil and subsoil of the Papakating silty clay loam:

Mechanical analyses of Papakating silty clay loam.

Number	Description	Fine gravel	Coarse sand	Medium sand	Fine sand	Very fine sand	Silt	Clay
		Per cent	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*	*Per cent*
162405............	Soil.........	0.1	1.4	1.3	8.1	4.9	52.4	31.0
162406............	Subsoil......	.0	.7	.9	6.0	7.2	52.0	33.2

MUCK

Muck represents accumulations of more or less decayed organic matter in a very finely divided state, mixed with some mineral matter, and existing naturally under poor conditions of drainage. The depth of the Muck ranges from 6 inches to 3 feet or more. It is very dark brown to black at the surface, and becomes distinctly brown with depth. At 20 inches or more the well-decomposed organic matter gives way to more fibrous material or peat. The underlying soil ranges from clay to sand and gravel.

Muck is mapped in large and small areas in every town in the county. The largest areas lie along Flint Creek in the town of Potter, and along West River at the head of Canandaigua Lake. The type everywhere is low and flat. It receives run-off from the surrounding, higher-lying areas, and is naturally poorly drained. The two larger areas are swampy most of the year.

The timbered areas support sparse stands of elm, soft maple, black ash, cedar, tamarack, hemlock, and alder. Some areas are covered with reeds, cat-tails, rushes, sedges, and aquatic plants. A little hay is cut, and some pasturage is obtained. Ninety-eight per cent of the type is undeveloped. Artificial drainage is essential before cultivation can be carried on.

Reclaimed areas of Muck in the adjacent county of Ontario produce excellent crops of celery, onions, potatoes, cabbage, and hay. In the production of these crops large quantities of commercial fertilizers and stable manure are used.

ROUGH STONY LAND

Rough stony land includes abrupt, steep slopes along streams, where the soil material is mixed with large quantities of stone or where the bedrock is exposed. It is mapped in several areas along Keuka Lake Outlet, Plum Point Creek, Big Stream, Rock Stream, and smaller streams in the eastern and southeastern parts of the county. The slopes in many places are perpendicular, so that the soft shales are exposed to weathering. Areas of rough stony land have no agricultural value.

SUMMARY

Yates County lies in the central part of western New York, in the Finger Lake region. It has an area of 343 square miles, or 219,520 acres.

The surface varies from undulating and gently rolling to hilly and mountainous. The lowest elevation is about 440 feet above sea level, along Seneca Lake, and the highest elevation is 2,110 feet, in the southwestern part of the county. The farms in the uplands have fair to good natural drainage. The bottom lands along the larger streams are poorly drained. Most of the drainage of the county goes northward into the St. Lawrence system.

Settlement in Yates County was begun in 1788, and by 1880 the population was 21,087. By 1909 it had dropped to 18,642. The early settlers came largely from the New England colonies. The present population is made up of their descendants and of newcomers of English, German, Norwegian, and Dutch descent. Approximately 75 per cent of the population is rural, and the density of rural settlement is reported as 40.9 persons per square mile. Penn Yan is the county seat and the largest town in Yates County.

The climate is typical of the Finger Lake region of New York. The winters are cold and the summers warm. The average length of the growing season is 163 days. Rainfall is well distributed throughout the growing season.

Agriculture is the main industry of Yates County. Corn, wheat, beans, and hay are the most important general farm crops grown. Grapes and apples are the principal fruits. Dairying is not important. Sheep husbandry is the main live-stock industry. The total value of all farm products in 1909 was $3,478,078, or an average of $1,520 per farm.

The farmers in general recognize the value of crop rotations. Commercial fertilizers are used on more than 60 per cent of the farms.

The total number of farms decreased from 2,504 to 2,288 during the decade 1900 to 1910. The average farm contains 89.3 acres. About 77 per cent of the farms are operated by owners. Almost 82 per cent of all the farm land is improved. Land values range from $5 to $200 an acre.

The soils of Yates County have been derived principally from glacial débris composed largely of sandstone, shale, and limestone. Some areas are occupied by alluvial, residual, or cumulose soils.

The Ontario soils are derived from limestone and sandstone. They have brown surface soils and lighter brown subsoils. Three members of this series are mapped. Corn, wheat, beans, and hay are the principal crops grown on the Ontario soils. Agricultural conditions are

very good. Land values range from $75 to $200 an acre for good farming areas.

The Wooster soils are derived from sandstone and shale material laid down as deep till. Four members of this series are mapped. Agricultural conditions on the Wooster soils are good.

The Volusia soils are brownish gray to yellow in color. They are derived from sandstone and shale and are poorly drained. Three types of this series are mapped in Yates County. The Volusia soils are not well developed agriculturally. Land values are high as compared with the prices for similar soils in other sections of the State.

The Allis and Lordstown soils represent thin glacial deposits from sandstone and shale. The Allis silt loam is poorly drained, while the Lordstown soils are fairly well drained. Agriculture on these soils is only fairly well developed.

The Schoharie silty clay is derived from fine lake sediments. It is naturally rather cold and poorly drained, but much of it has been tiled and is under cultivation. General farm crops are grown and the yields are good.

The Chenango soils consist of old alluvium laid down in the form of terraces; the material is largely from sandstone and shales. The Chenango soils are in a good state of agricultural improvement.

The first-bottom soils are grouped in the Holly, Genesee, and Papakating series. The Holly soils are gray, with mottled subsoils, and are poorly drained. The Genesee soils are brown and fairly well drained. The Papakating soils are black and poorly drained. These alluvial soils are used to some extent as hay and pasture land.

Muck occurs in all parts of the county, and some of the areas are quite extensive. None of this soil is under cultivation.

Rough stony land occurs in small areas and is mainly nonagricultural.

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Making and Storing Butter for Home Use

E. S. Guthrie

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MAKING AND STORING BUTTER FOR HOME USE

E. S. GUTHRIE

Farmers can provide their families with butter thruout the winter by making and storing a supply during May, June, and July. There is a surplus of milk during this period and the market price is lower than at any other time during the year; therefore making surplus milk into butter for home use is wise economy. Butter has high food value and contains growth-promoting substances especially needed by children. For these reasons it should form an important part of the diet in the farm home.

Heretofore farmers have not generally taken advantage of this method of supplying themselves with butter for winter use because of their failure to make butter of good keeping quality. The method of manufacture outlined in this bulletin is not feasible for butter that is to be used immediately, but it should be followed carefully for butter that is to be stored for a long time.

THREE IMPORTANT POINTS

Sweet cream, pasteurization, and proper packing are essential to the successful making and storing of butter.

1. The cream must be perfectly sweet. The buttermilk from cream in the proper condition for making storage butter is as sweet as fresh skimmilk. If the cream is allowed to sour, a strong and perhaps a fishy flavor may develop in the butter.

2. The sweet cream must be pasteurized for two reasons. First, the butter will keep much better if most of the bacteria in the cream are killed by heating. Second, sweet cream is difficult to churn if its sticky quality, or viscosity, is not broken by pasteurization.

3. Earthenware jars are the best containers in which to store butter, but wooden tubs may be used. The container must be scalded thoroly, and cooled immediately before butter is packed in it. The surface of the butter, after it is packed in the container, should be covered with a white cloth that has been made practically sterile, or free from bacteria, by boiling in clean water for a few minutes. The diameter of the cloth should be about two inches greater than the diameter of the jar. The cloth should be covered with a layer of salt about one-sixteenth of an inch deep, to keep the surface of the butter from spoiling. The cloth is merely to aid in lifting the salt from the butter when a portion of it is taken out for use.

APPARATUS AND SUPPLIES

The number and the size of the utensils depend largely on the amount of butter that will be packed. The following equipment (fig. 16) should be available:

One separator or substitute; one or two shotgun cans with covers; one churn; two ladles; one dipper; one butter bowl; one strainer; one set of scales; one thermometer; one small pan for salt; one wash boiler;

FIG. 16. EQUIPMENT FOR MAKING BUTTER ON THE FARM
The separator is not shown. The large dipper has a strainer bottom

if the butter is printed, one single-pound butter printer; earthenware jars; white cloths; dairy salt; if prints are made, a supply of parchment paper sheets 8 x 11 inches and of the quality furnished by dairy supply houses. This paper should be kept in a clean, dry place where molds will not grow.

CARE OF THE UTENSILS

The condition of a workman's tools has a definite relation to the quality of his work. In the same way there is a direct relation between the care of the dairy utensils and the quality of the butter made.

All dippers, strainers, pails, cans, and tinware should be not only carefully washed but thoroly scalded with boiling water. This process will kill most of the bacteria and will also dry the utensils and thus prevent rusting. They must not be wiped with cloth. Ladles, the butter bowl or board, the butter printer, and all wooden utensils not only should be thoroly washed and scalded after being used, but should be soaked in boiling water and then thoroly chilled in cold water before being used, in order to prevent the butter from sticking to them.

The churn must be kept sweet. This cannot be emphasized too strongly. Under normal conditions thoro scalding after each churning is sufficient to keep it in good condition. In case the churn has a musty odor it should be filled with a saturated solution of limewater. This may be made by slaking burned lime, adding water, stirring the mixture thoroly, and allowing it to stand for a few hours. After the lime has settled, the clear limewater may be dipped off and put into the churn. Several new supplies of limewater may be made by adding more water to the lime, stirring the mixture thoroly, and allowing it to settle as in the first case. The limewater should be placed in the churn as soon as it has been thoroly scalded after using, and allowed to remain until the churn is used again. Stone and metal churns do not need to be treated with limewater, for they do not become musty if they are properly aired, nor do they dry out and fall apart. For these reasons some butter makers prefer churns of stone or metal to those of wood. However, temperatures can be more easily controlled in a wooden churn than in either a metal or a stone one, and also butter does not stick to a wooden churn as it does to other kinds.

PLANS TO BE FOLLOWED WHEN BUTTER IS MADE ONLY OCCASIONALLY

One of the following plans may be found satisfactory by farmers who produce milk for consumption as milk and who wish to undertake the storing of butter for home use:

Plan 1. Where it is convenient, several farmers may cooperate by buying the necessary equipment and hiring one of their number to make the butter. In such case a modern centrifugal separator should be provided, and it would be necessary to haul the milk to the farm on which the separator was installed.

Plan 2. Several neighbors may cooperate in purchasing the equipment. Farmer A may use it for a week or two and then Farmer B may have his turn, and so on until all have made their supply of butter for the year.

Plan 3. The gravity method of separation may be employed. This is not so efficient as centrifugal separation, for two reasons: first, more

fat is lost in the skimmilk; secondly, the cream is thinner and consequently it is often difficult to churn. If farmers cannot afford to purchase a centrifugal separator to be used for only two or three weeks each year, gravity skimming is the only alternative.

HOW TO OPERATE A CREAM SEPARATOR

A centrifugal separator is a delicate machine. It should be carefully placed in a level position on a solid and sanitary base in a place where the cream will not be contaminated by dust and dirt and where there are no objectionable odors. The separator should be held in place firmly but not rigidly; therefore the lag screws should not be screwed down tight unless the manufacturers so direct in the printed instructions that accompany each machine.

The bowl devices of a separator must be properly placed so that the bowl will run with perfect poise. Many separators are turned with difficulty because the bowls are not properly balanced, and a separator cannot do efficient work when the bowl is not in proper working order. The rubber ring that seals the bowl must be sufficiently soft to make the joint milk-tight. If the rubber ring is hard, it should be held in warm water until it is softened.

The separator should be properly oiled. Manufacturers of separators furnish directions for oiling, and these should be carefully followed.

Milk that is to be separated should be of the proper temperature, that is, from 85° to 90° F. This is essential to the efficient operation of the separator.

The rate of speed at which the separator is operated is important. All hand separators have the number of revolutions of the crank necessary for efficient separation marked on the crank and this speed should be carefully maintained.

When a separator is running at the proper rate of speed, the gate of the supply tank should be opened wide so that the proper amount of milk will flow into the bowl. The float, if working properly, will maintain a uniform flow into the bowl and will prevent the milk from overflowing.

At the close of the run the bowl should be flushed with enough skimmilk or water to force the cream out of it. In most cases skimmilk should be used for this purpose. Two quarts of skimmilk, run thru the bowl while it is revolving at the full rate of speed, is sufficient for flushing, but the amount depends more or less on the size of the separator bowl, the percentage of milk-fat in the cream, and the temperature of the whole milk. If the cream is rich in milk-fat and the temperature of the whole

milk is low, after the bowl has been flushed with skimmilk some water of a temperature of about 120° F. should be run thru the bowl in order to carry out the milk-fat. Care should be exercised not to use so much water that the cream will be greatly diluted.

Cream for churning should contain from 30 to 35 per cent of milk-fat. In case adjustments have not been previously made, the cream screw in the separator bowl may have to be so regulated that the cream will be of approximately the right percentage of fat for churning. This may be done by running a given volume of water thru the separator when the bowl is revolved at the proper speed. From one-eighth to one-tenth of the volume of water should be delivered thru the cream spout.

SKIMMING MILK

The gravity method of separation may be used, but it is not so efficient as centrifugal separation for two reasons. First, more fat is lost in the skimmilk; secondly, the cream is thinner and consequently it is often difficult to churn. If a centrifugal separator is not available, however, gravity skimming is necessary. Two ways of skimming by the gravity method are outlined in this bulletin; the first is suitable for use when only a small quantity of butter is made, the second for use when butter is made on a larger scale.

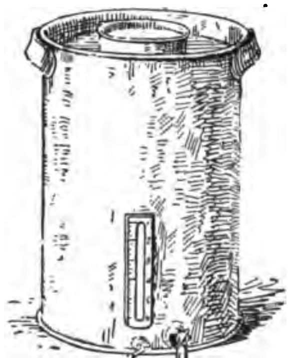

FIG. 17. THE DEEP-SETTING METHOD OF SKIMMING MILK

The center space should be filled with cold water. If the milk is held during hot weather for longer than the average period, the can should be set in cold water

If a farmer wishes to make his butter during a period of several weeks or possibly two or three months, or if only a few pounds are needed, as in the case of a small family, the method of skimming illustrated in figure 17 is satisfactory. In this case it would be advisable to set the can in cold water.

When making butter on a fairly large scale, two or more 40-quart milk cans should be used as containers. Immediately after the milk is drawn, it should be placed in these cans in the cooling tank and stirred until it is 50° F. or less in temperature. After the milk has stood for approximately forty-eight hours, the cream should be carefully skimmed off with a shallow dipper. If the milk stands for a shorter period, a high percentage of fat will be lost in the skimmilk. Low temperatures must be maintained thruout the holding period in order to keep the cream sweet. About ten or twelve pounds of cream for churning should be skimmed from the 40-quart can of milk; then about a gallon of milk

should be skimmed into another pail. This latter skimming will contain about the same percentage of fat as whole milk, and may be used as such in the home. When this method is followed, the skimmilk will contain less fat than if only one skimming is made, and the cream will be richer in fat and will therefore churn more readily. In some cases shotgun cans (fig. 16) may be used to better advantage than 40-quart milk cans.

PASTEURIZING CREAM

Cream may be pasteurized on the farm in the following way:

Place a wash boiler partly filled with water on the stove, as shown in figure 18.

FIG. 18. FIRST STEP IN PASTEURIZING CREAM

The temperature of the cream should be raised to at least 145° F. and held at this temperature for twenty or thirty minutes

Set the shotgun cans or the pail containing the cream in the water, and allow it to remain over the heat until the temperature of the cream reaches 145° F. Stir the cream gently, not vigorously, so that it will heat uniformly.

Move the boiler to the back of the stove, and hold the cream at the temperature of 145° F. or a few degrees higher for twenty or thirty minutes.

If the temperature of the cream reaches 160° F., the flavor of the butter will not be injured.

Cool the cream to 50° F. or lower, and hold it at this temperature for at least three hours. Usually in creameries, it is held at this temperature overnight. Stir the cream gently so that it will cool more rapidly.

The cream may be cooled by running cold water into the boiler, as shown in figure 19, or many farmers may find the milk-cooling tank more

FIG. 19. SECOND STEP IN PASTEURIZING CREAM
After the cream has been heated to a temperature of 145° F. or higher, it should be cooled to 50° F. or lower.

convenient for this purpose. If the first method is used, a hose or some other device should be employed, so that the cold water enters the boiler near the bottom at the upper end, as shown in the figure. By this arrangement the water will flow the full length of the boiler and will be much more efficient in cooling the cream than if it entered and flowed out at the same end of the boiler.

CHURNING

The following rules must be observed in churning:

Place the ladles, the butter bowl or board, and the printer, in boiling water.

Have the temperature of the cream correct; that is, so that churning will require from thirty to forty-five minutes. The range of temperature usually is from 56° to 62° F., according to the richness of the cream, the nature of the milk-fat, the size of the fat globules, and the amount of cream in the churn. If the temperature is too high, there is danger of incorporating too much buttermilk and the flavor of the butter is likely to be injured.

If the churn has not been used for a few days, scald and cool it. The churn should be moist so that the cream will not stick to the walls.

Pour the cream into the churn thru a brass or copper wire strainer that has about twenty meshes to the inch, so as to remove lumps and any foreign material.

Add coloring matter to the cream, if coloring is necessary.

Turn the churn sufficiently fast to insure good agitation. If the speed is high, the cream will stick to the sides of the churn; on the other hand, if it is low, churning will take too much time. Maintain a medium speed at such a rate that the falling of the cream may be felt.

Open the churn two or three times during the first of the churning in order to release the gas.

The loosening of the cream on the sight glass in the churn is a good indication that the butter is coming. Continue churning until the granules of butter are about the size of grains of corn.

Draw off the buttermilk thru a strainer in order to save particles of butter that might be carried out with the buttermilk.

WASHING, SALTING, AND WORKING THE BUTTER

The woodenware should now be placed in cold water.

The butter should be washed twice with water at a temperature of from 50° to 55° F. About as much water as there was cream should be used each time, and the churn should be revolved three or four times. Bacteria thrive on the constituents of buttermilk, and the more completely it is washed out, the better the butter will keep.

After the butter is washed it should be salted with a good grade of dairy or household salt. The salt may be scattered over the butter while it is in the churn, or it may be spread over the butter on the working board or in the working bowl. The amount of salt should depend on the taste of the consumers; usually from three-fourths to one ounce of salt to each pound of butter is desirable.

Butter should be worked for two reasons: first, in order to distribute the salt thoroly; secondly, in order to compact the butter. Experience only will determine when butter has been worked enough. If mottles appear after the butter is twelve or fifteen hours old, it has not been worked enough. The butter should appear waxy and compact.

When working butter by hand the ladles should be pressed almost straight downward. A sliding motion should not be used, for more fat globules are likely to be broken than in the first method and the butter will become smeary and greasy.

PACKING

If the butter is packed solidly in a stone jar, it should be covered with a white cloth and a layer of salt, as described on page 83.

If printed butter is packed for storage, the wrappers should be held in place by white cord passed around each print both lengthwise and crosswise. The prints should be packed in a stone jar that has been scalded carefully and cooled, and a large plate should be placed on the butter and weighted down with bricks or stones that have been cleaned thoroly and scalded. Finally, the butter should be covered with a saturated solution of brine made by adding salt to water in the proportion of one pound of salt to four pounds of water. A 10-gallon jar will hold fifty pounds of butter in prints with about an inch of brine over the top surface. An extra supply of brine should be kept on hand in fruit jars or other sealed containers, and added to the butter jar as the prints are removed or as the brine in it evaporates.

STORAGE

Butter must be held at moderately low temperatures. The cellar is the best place for storing butter on the farm, but the jar must be covered properly so that the butter cannot absorb odors of fruits and vegetables stored near it.

THE LAST WORD

In making and storing butter, either in creameries or on the farm, emphasis must be placed on sweet cream, pasteurization, and packing

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FIRST LESSONS IN SEWING

A MANUAL FOR JUNIOR EXTENSION WORKERS IN CLOTHING

CLEANING AND OILING A SEWING MACHINE

NEW YORK STATE COLLEGE OF AGRICULTURE, UNITED STATES DEPARTMENT OF AGRICULTURE, NEW YORK STATE DEPARTMENT OF EDUCATION, COOPERATING

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FIRST LESSONS IN SEWING

NANCY HILL MCNEAL

THE junior home project work in clothing has much to commend it. Few tools are necessary. No previous training is required. With little or no aid from a special teacher, it is planned to give every girl an opportunity to learn the art of clothing herself. By so doing she may also be of direct and indirect service to others. The best kind of education for life is to be able to get the best value in return for output of labor, time, and money. A girl who completes this project must learn some of these things. The girl who is beginning this work should bear in mind the three following suggestions. Choose simple problems, and do not give up until they are finished. Do your best, so that the resulting work may be both beautiful and useful. Take advice from persons more experienced than yourself.

This manual is intended for use by girls registered for junior home project work in clothing. It includes such general information as the worker should have before beginning the project, and the directions needed for the handwork and the repair work covered by the project. It is not expected that the younger girls will be able to use this material to any great extent alone.

A second manual, entitled *Elementary Garment Making*, contains the directions for all the machine problems and will be sent to workers in Classes B and C. A copy of each of these manuals will be sent to the teacher, to whose interest is due, at least in part, the registration of the girls for the project work. Mothers are the logical advisers of their daughters in this work, which is planned with the idea of encouraging interest in the usual home tasks and helping girls to be of service.

Girls should learn to make their own clothing and help with other family sewing as early as possible. Emphasis is laid on necessary repair work, the use of the sewing machine, the use of commercial patterns, and the wise selection of material for simple practical garments.

All girls who undertake the clothing project should read the general requirements (p. 37 to 39). It is wise to complete the work in the order suggested in the list of requirements and to take time to do each piece of work well.

SEWING TOOLS

The tools necessary for handwork in sewing are: scissors, thimble, tape measure, needles, thread, and pins. In order to take proper care of these small tools, each worker should supply herself with a small pincushion and a box, a basket, or a bag.

The scissors should be sufficiently large and sharp to cut garment materials even and smooth. They should not be used for cutting cardboard, paper, or wire.

The thimble should fit the middle finger of the right hand, upon which it is to be worn. Metal thimbles are more satisfactory than those of celluloid, because they are less clumsy.

A tape measure numbered on both sides but with the numbers beginning at opposite ends, is more convenient than one on which the numbers begin at the same end.

Needles of assorted sizes may be obtained in packages. Those numbered "5-10" or "6-12" will serve all needs for the project work. A beginner is likely to select too coarse a needle for the material. It is more easily threaded than a fine needle but much harder to push thru the cloth. The sooner a worker can use a fine needle and thread, the sooner she will be able to sew well and easily.

The thread needed for the project work will vary in number from 40 to 50 for basting, sewing on buttons, and making buttonholes, to 70 or 80 for finishing and for machine work. A fine needle requires fine thread.

Pins should be small and should have sharp points. Many persons do not appreciate good quality in pins. It is more economical in the long run to buy good pins than poor ones.

A sewing machine is needed for making the garments. It is unwise to sew long seams by hand when they can be done more rapidly and better by machine. If a pupil cannot have the use of a machine, she may do more handwork, but if possible she should be provided with a machine.

USE AND CARE OF THE SEWING MACHINE

Sewing is taught nowadays by making useful articles.

In these days of scarcity of labor, the use of labor-saving devices is becoming increasingly important. The sewing machine is one of the simplest and best of all labor-saving devices for the home. Garment

FIG. 1. SEWING TOOLS
Very few tools are needed for the sewing project work

making should enter into a course in sewing very early, and the use of the sewing machine should begin at the same time. Life and time are too precious to spend making entire garments by hand, except in unusual cases. This is a day when perhaps the minimum of hand sewing should be done; any that is necessary may be carried along with machine sewing.

A child ten years old can often use a sewing machine satisfactorily. It is customary in schools to begin machine work in the sixth grade.

In order to use a machine successfully, the operator must know the machine. It is amazing to find how many persons have used a sewing machine for years without having really studied it. The result is that very soon the machine does imperfect work, because of unintelligent use and lack of care. It is so easy to understand a machine and to keep it in good running order, and so gratifying to use a machine that works properly, that girls should be interested in this part of their work just as boys enjoy taking care of automobiles as well as running them.

All sewing machines work on the same general principles. If a worker knows one kind well, she can use any machine successfully with a small amount of practice.

STUDY OF THE MACHINE

The book of directions accompanying a sewing machine should be studied until the principal parts of the machine are familiar. If this book has been lost, another should be obtained from the company. It is unwise to try to use the machine without this book. The names of the prominent parts, such as the balance wheel, the take-up lever, the presser foot, the feed bar, and the bobbin, should be learned.

RULES FOR USING THE SEWING MACHINE

The following simple rules for using the sewing machine should be observed until good habits are formed.

1. After threading the machine, always bring the lower thread up thru the hole under the presser foot, by holding the upper thread while you turn the balance wheel around once and then catching the loop that is pulled up. If this is not done, the cloth will very likely catch or the threads will be tangled underneath when you begin to stitch.

2. When ready to remove the cloth from the machine, see that the take-up lever is at the highest point, then draw the threads out, keeping the upper one under the presser foot so as not to spring and bend the needle. Cut the threads, leaving ends at least three inches long on the machine. If the take-up lever is not at the highest point when the threads are cut, the upper thread will be so short that it will be drawn out of the needle and necessitate rethreading. This is a great inconvenience and a waste of time. If these rules are observed, the thread should never become tangled and the needle should not need to be threaded except when a change of thread is necessary.

3. Keep a supply of needles on hand, and change the one in use as soon as it becomes imperfect. This is absolutely necessary for good work.

FIG. 2. STITCHING ON THE MACHINE

This worker sits well back in her chair with her head up. She keeps her hands away from the needle, and never forces the cloth under the presser foot. She is careful to place her machine so that the light comes from the left and falls directly on her work. If you practice these things at first, you will soon fix good habits. When you become skillful in the use of the machine, sewing will go quickly and easily

A poor needle can cause no end of trouble. You may even think that your machine is badly out of order when merely a new needle would set things right.

The more careful you are in the use of your machine, the sooner you will become skillful in handling it, and the sooner you will cease to spoil your needles and to do poor work. In the book of directions for the use of the machine, other important rules will be found.

CLEANING AND OILING

A machine must be kept clean and well oiled in order to do good work. A workman can be fairly judged by the condition of his tools.

A small brush should be used to clean away all lint. Especially should the plate under the presser foot be removed often for cleaning, since the greater part of the lint collects at this point.

The machine should not have so much oil applied that it is dripping for days; one drop should be put in a place, and every hole and every joint where there is friction should be oiled. The machine should be oiled once every week, if it is used almost every day.

Probably no other instructions in connection with the clothing project are so important as these. A girl who likes her machine, takes proper care of it, and becomes skillful in the use of it, will find continued pleasure and profit in sewing.

HYGIENE OF CLOTHING

Health depends to a great extent on the kind of clothing worn. This fact is especially important to young people who desire above all things to be strong and healthy. Girls who are having an opportunity to help in selecting material and patterns for their clothing should keep in mind the following facts.

Clothing should help to regulate the body temperature — to conserve heat in winter and to radiate it in summer. The underwear has more to do with this than do the other garments; therefore it should be made of soft and loosely woven material. The spaces between the threads hold a layer of air, which allows cold air to pass thru slowly, thus saving the body from sudden changes of temperature. This kind of cloth also absorbs moisture easily and is readily cleansed. In very cold climates it is better to wear several layers of light-weight clothing than fewer very heavy ones, since in this case again the layers of air between the garments help to keep the body warm.

Cotton is better than wool for undergarments for young, active persons. Wool absorbs moisture and oil from the skin very well, but holds moisture to such an extent that the garment often feels damp. Moreover a woolen

garment is hard to cleanse. Knitted cotton cloth, if soft and loosely woven, is sufficiently warm for any but young children even for winter, and gives up the body moisture easily. A cotton garment can also be properly sterilized without shrinking.

Clothing should allow freedom of movement and of circulation. This means no tight bands at waist, neck, or knees, and no tight shoes. Clothes should be so comfortable that one can be entirely unconscious of them. Materials and patterns, then, should be selected from the point of view of comfort and health.

SELECTION OF MATERIAL

One way of making the best possible use of time and money is to select all material for household use and for clothing with the greatest care. It should be the best obtainable for the money. Of course manufacturers make what women demand. It is astonishing and often discouraging to see what are " the best sellers " in stores or factories. For example, in the making of cloth the bleaching process weakens the fibers, adds to the cost, and requires much more labor, yet women usually insist on having all household linens and underwear muslins bleached. Why should we not learn to use the unbleached materials, that have so many advantages? Our grandmothers used these materials; they were evidently wiser than we are.

Ready-made garments that are overtrimmed are often selected or copied. They are bad in design, as those who have some art training know, and they are often made of poor material; but the buyer thinks that they are "pretty" regardless of their disadvantages. Good design, good workmanship, and good quality in cloth and trimming should receive first attention when garments are bought or made.

There are many other things that one should know in order to select clothing wisely, but even these two suggestions, if heeded, will help toward creating a higher standard than many buyers now have.

COLOR AND DESIGN

Nothing goes farther toward making a garment satisfactory than good colors. All school girls have some training in art nowadays, but it is not always applied to such things as clothing, and sometimes they fail to see any connection. One of the chief concerns of project workers should be to try out in this practical way all the rules that they have learned about the use of color.

First, the color of a garment should be becoming to the wearer, that is, it should harmonize with the coloring of her hair, her complexion, and her eyes. A color may be very good by itself and yet be bad when brought

close to some other color with which it is out of harmony. Furthermore, even tho a color is good, it may not add to the beauty of the wearer. Clothing should be a setting or a frame for the face and form; it should never obscure them by attracting most attention to itself.

Colors that are not too bright or pure, but that are somewhat dull, are in general the most satisfactory, because they allow good features to be appreciated and they do not attract attention to less fortunate features. Persons who have very clear skin and good color can wear clothing of almost any color. Young girls, therefore, are generally not so limited in their choice as are older persons. However, the project worker can turn her appreciation of good use of color to account in helping to choose

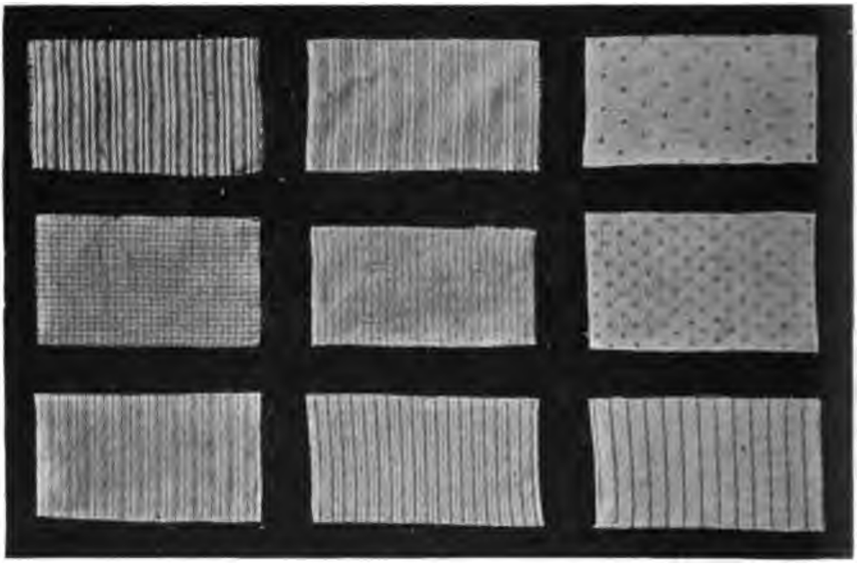


FIG. 3. MATERIALS SUITABLE FOR APRONS

clothing for other members of the family. It is knowledge that a girl or a woman needs every time she buys a new dress or a piece of furniture, or scarfs, curtains, rugs, wall paper, or china.

A few simple rules relating to color cannot be overemphasized. If the student has learned them already, these suggestions will serve as a review; if they are new to her, she may not be able to understand them fully, but she can at least make a beginning.

Color has three elements:

1. Hue is the characteristic of a color by which it is known as red, blue, green, purple, yellow, or orange.

2. Value is the lightness or the darkness of a color.

3. Intensity is the amount of brilliancy or pure color that a color contains.

It is easy at first to confuse value and intensity. A color may be pure or bright, but at the same time it may be very light or very dark. Its value depends not on brilliancy, but on the lightness or the darkness.

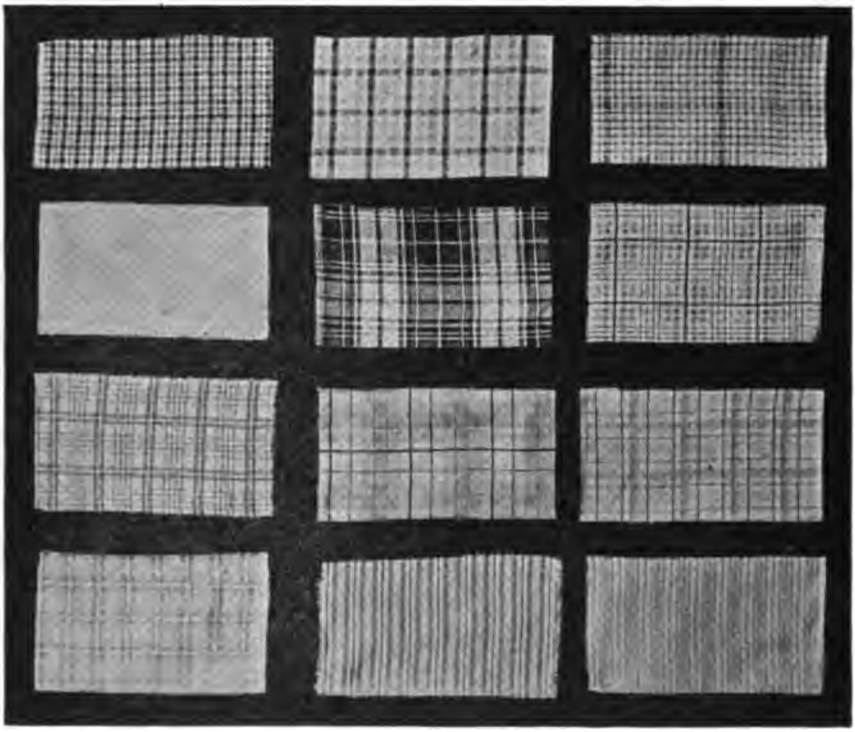


FIG. 4. DRESS MATERIALS OF GOOD DESIGN

The most intense color is the strongest one. Few persons can wear intense color, such as bright red, except in very small quantity. As the artistic taste is developed, a person learns to like, for general use in large masses, the colors that are somewhat grayed. The size of the person should influence to a certain degree the colors worn. Large persons in general look well in the more quiet colors.

Some colors are warm, and some are cool. The warm colors, which have tinges of red, orange, or yellow, produce an effect of warmth and cheer; the cool colors, which are related to blue or green, produce the opposite effect. Therefore colors should be used with discrimination.

One of the hardest problems in connection with color is to decide what colors look well together. This is a question of harmony. The simplest harmony is sometimes called the one-color, or one-hue, harmony. It is generally satisfactory to combine two or more shades of the same color. Suits and dresses may be all brown, for example, with the greater part dark and the trimming light.

Another harmony is called complementary, or opposite. Blue and orange, purple and yellow, red and green are opposites. It is necessary to use only a small amount of one with a large amount of the other in this case. Touches of black help to harmonize or bring colors together.

The background must be considered in producing a harmony of color. The occasions for which a garment is to be worn should also be considered. Some colors are suitable for wear indoors, especially in the bedroom, and some are good in the evening. These same colors may be disagreeable outdoors or in strong daylight.

Quiet color in dress is evidence of good taste. Colors do not need to be brilliant to be beautiful.

Design should also be considered. For example, long vertical lines, especially thru the center of the figure, give the effect of height, while cross lines cut off height. Large persons should not wear large plaids or broad stripes since these tend to emphasize their stoutness. Tall thin persons may wear models that short stout persons should avoid.

These things should be considered in the selection of material for a garment and in the choice of the pattern.

PATTERNS

The use of patterns is an interesting and important part of the project work. No other acquirement does more to give courage and success in sewing than does the understanding of patterns. Any girl ten years old should be able, with a little study, to use a simple pattern successfully. Only simple patterns are advised or needed for project work.

Patterns should be selected from a book with illustrations, if possible. A separate sheet with drawings and numbers, from which patterns may be ordered in case a book is not available, will be sent to each worker.

Directions for using a pattern are as follows:

1. Make sure that you have obtained a pattern of the proper size according to either age or measure.

2. Read all directions carefully. Study the chart that shows how the pattern is put together.

3. Make sure that you recognize the different parts, such as front, back, sleeves, and collar.

4. Select the parts that you need for your garment. There are often two styles of some parts.

5. Place the large pieces on the cloth first, noting where the cloth is to be folded or doubled if only one-half of the pattern is given.

6. Note the row of perforations that shows how the pattern is to be placed with reference to the threads of the cloth.

7. Practically all patterns allow for seams; shoulder and underarm seam allowances are often wider than others to permit fitting. Examine

FIG. 5. USING A COMMERCIAL PATTERN

Any girl even ten years old can use a commercial pattern successfully if she begins with a simple one and reads the directions carefully

the markings that show how much is allowed, and, when basting the garment, take up just this amount.

8. Be very careful to prevent any unnecessary waste of cloth.

9. Handle your pattern carefully. It can be torn easily, and you may wish to use it many times.

RENOVATING AND REMODELING

Making over old clothing does not always pay, yet many garments quite as good as new have been made from old material. An old garment

or old material that promises to wear long enough should by all means be used in making a garment. Many small dresses and aprons have been made from the good parts of men's shirts. Often flour sacks are used for making underwear or aprons.

Old material should be well cleaned and pressed before being cut into another garment. Any spots or stains should be removed, or the pattern should be placed in such a way as to avoid them.

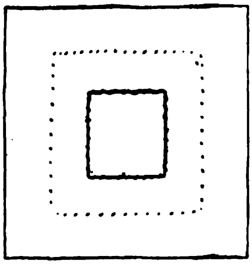
SUGGESTIONS AND DIRECTIONS FOR CLASS A HANDWORK

The requirements of the clothing project for Class A, as listed on page 37, are as follows:

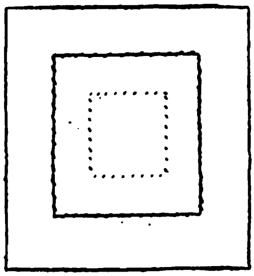
PATCHING

The project workers in Class A are asked to make a patch. It is expected that they will make others as needed after practicing on this. Even the first patch should be fairly good if instructions are carefully followed; it may be made on some garment on which it is needed.

MAKING A HEMMED PATCH



A



B

FIG. 6. HEMMED PATCH
A, Right side of patch; B, wrong side of patch

The hemmed patch (fig. 6) may be used on clothing, table linen, and other articles. Directions for making a hemmed patch are as follows:

1. Cut away the worn parts around the hole, making the opening square or oblong. Cut by the warp threads in one direction and the woof threads in the other direction.

2. Cut from material that matches the material of the garment as nearly as possible, a piece that is larger than the hole by three-fourths inch on all sides. If there is a design in the material, it should be matched.

3. Fold the cloth in such a way as to crease the center of the four sides of the opening. Fold and crease the piece for the patch thru the center of each of the four sides.

4. Place the patch on the garment so that the creases match, and pin it in place at the corners and in the center of the sides. Baste the patch in place halfway between the edge of the opening and the edge of the patch. Use short stitches, and fasten the ends of the threads securely. It is important that the patch be held firmly in place.

5. Turn in about three-eighths inch on the edge of the patch, and also on the edge of the hole. The edge of the hole must be slashed at the corners to permit this turning.

6. Baste each turning with small even running stitches.

7. Hem the edges down on both sides with short stitches. Remove the basting, and press the patch.

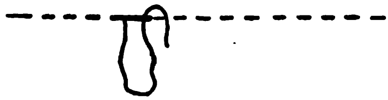


FIG. 7. RUNNING STITCH

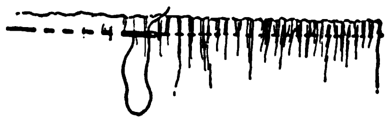


FIG. 8. GATHERING STITCH

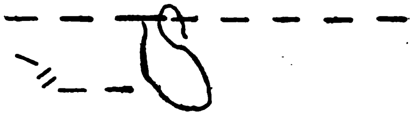


FIG. 9. EVEN BASTING

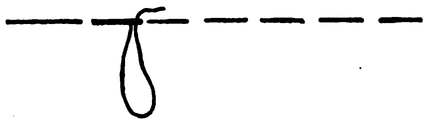


FIG. 10. UNEVEN BASTING

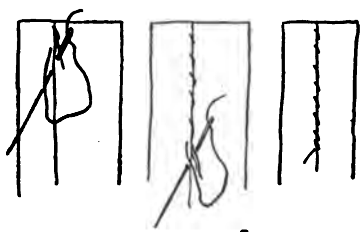


FIG. 11. PLAIN HEMMING

RUNNING STITCH

The running stitch (fig. 7) is the simplest of all hand stitches. It may be fastened at the first end with a knot in the thread or by taking two or three short stitches over each other. It is made by running the needle in and out of the cloth in such a way as to make short even stitches and spaces. It is used in making seams on which the strain is not great. It is also used in gathering (fig. 8); in this case the cloth is drawn up on the thread, and a double thread may be used for strength.

BASTING

Even basting (fig. 9) is one form of running stitch. It is usually made with larger stitches, since they are to be removed after firmer ones are put in. Uneven basting consists of a long and a short stitch and is used especially for marking (fig. 10).

HEMMING STITCH

The hemming stitch (fig. 11) is taken from right to left thru a folded edge of cloth to hold it down to another layer of cloth.

1. Place the cloth over the forefinger of the left hand so that it takes a vertical direction.

2. Fasten the thread at the first end by leaving an end to tuck under the hem and catching it under the first few stitches.

3. Take slanting stitches equal distances apart, catching with each stitch a few threads of the garment and a few threads of the fold that

is to be held down. Fasten the thread by taking two or three small stitches over each other.

DARNING

Darning stockings is one way in which even small girls can be of great help to their mothers. If a girl darns her own stockings, she is of course working for herself, but she is also relieving her mother of a part of the family mending.

Darning is weaving threads in and out to match the weave of the cloth as nearly as possible. It is not a difficult task if done before the holes become large. Some girls have found darning a pleasure when they were so expert that they could help members of their family out of distress over a torn garment. For this project, darning should be done on an article that needs it rather than on a sample.

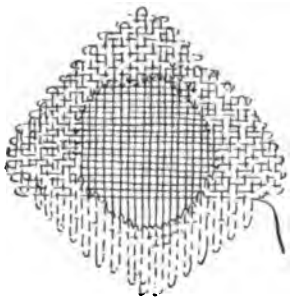


FIG. 12. STOCKINET DARN

DARNING A HOLE

Directions for darning a hole in a stocking are as follows:

1. Use a darning thread that matches the stocking in color as nearly as possible. Use from two to four strands, the number depending on the weight of the stocking. The needle should have a long eye and should be as fine as the thread will allow. A large needle makes good darning difficult.

2. Hold the darning over the hand or on a darner.

3. Take several short running stitches, beginning about one-half inch from the edge of the hole and placing the needle lengthwise of the material.

4. Run rows of stitches back and forth near together, until the edge of the hole is reached; then carry the thread across the hole each time until the opposite edge is reached. The threads should run well out beyond the edges of the hole, in order to make the darn smooth and to strengthen any worn parts. Make several rows at the side of the hole, after the hole has been covered.

5. Repeat the entire process in the opposite direction, but instead of carrying the threads across the hole take them under and over the first rows of threads, alternating them as in weaving (fig. 12).

BAGS

Any one of several different kinds of bags may be made by workers in Class A. It is not worth while to make a bag unless there is a special use for it. Any girl can almost certainly find in this list one useful bag that she does not possess — a sewing bag, a book bag, or a knitting bag.

SEWING BAG

Directions for making a sewing bag such as those shown in figure 13 are as follows:

1. Cut a piece of cloth about eighteen inches wide and about twenty-two inches long. It may be gingham, poplin, crash, or any similar material.

2 Place the two narrow ends together, and fold the piece in half. Make plain or french seams at the sides, using a very short running stitch or a backstitch. Leave a three-fourths-inch opening in each seam three inches from the top in order that a drawstring may be inserted.

3. Make a narrow turn to the wrong side around the top. Make a second turn that will bring the edge of this hem just to the lower edge of the opening left in the seam.

4. Baste this hem in place; then fasten it with very short running stitches or the hemming stitch.

5. Mark a line in the hem with basting or a crease three-fourths inch above the edge. Make a line of short running stitches on this mark to form a casing for the drawstring. Tape or cord may be used for the drawstring.

FIG. 13. SEWING BAGS

These bags are made of inexpensive wash materials and decorated with simple stitches. Such a bag will be of great service to a sewing project worker

6. A small design may be made on the bag with a simple embroidery stitch, such as cross-stitch or satin stitch. Each corner is tacked to a point about halfway up the side and finished with a decorated button.

SEAMS

The plain and french seams are used more often than any others in simple garment making.

1. A plain seam (fig. 14) is made as follows:

(a) Place the right sides of two pieces of cloth together with the edges that are to be joined exactly even. (b) Baste them together with an even basting stitch about one-half inch from the edge. (c) Sew the seam

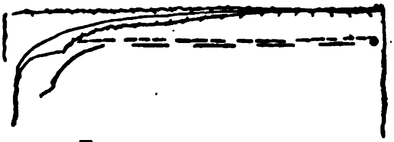


FIG. 14. PLAIN SEAM

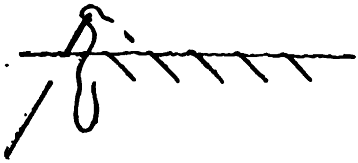


FIG. 15. OVERCASTING

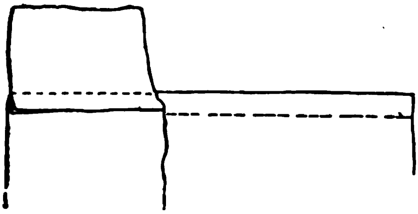


FIG. 16. FRENCH SEAM

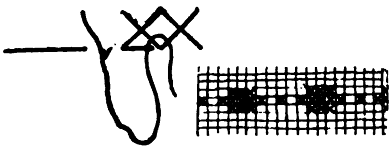


FIG. 17. CROSS-STITCH

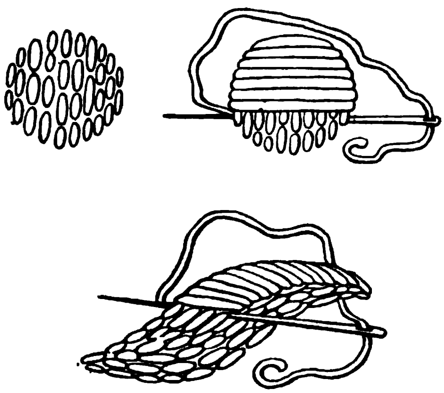


FIG. 18. SATIN STITCH

less than one-fourth inch from the edge with a running stitch, or a backstitch, or on the machine. (d) Overcast the edge of the seam to keep it from raveling (fig. 15).

2. A french seam (fig. 16) is made as follows:

(a) Make a plain seam on the right side of the garment. (b) Trim the seam as narrow as possible without allowing it to pull out at the stitching. (c) Crease the two sides out sharply from the seam; then crease the material a second time with the two right sides of the cloth together and the seam exactly on the edge. (d) Baste the seam very near the edge. Stitch the seam less than one-fourth inch from the edge with the running stitch, or the backstitch, or machine stitching. This second line of stitches should enclose the first seam entirely.

DECORATIVE STITCHES

A design in cross-stitch or satin stitch may be used to decorate the bag:

1. Cross-stitch is especially suitable for use on checked materials, whether the checks are formed by different colors or by the weave of the cloth (fig. 17). Each cross-stitch is formed by two stitches that cross each other at the center. Cross-stitch is made as follows:

(a) Hold the cloth over the forefinger of the left hand so that you can work directly toward you. (b) Bring the needle thru the cloth at the lower left-hand cor-

ner of the check that is to be crossed. (c) Take the first stitch by putting the needle in at the upper right-hand corner of the check and bringing it out at the lower right-hand corner. (d) Take the next stitch by putting the needle in at the upper left-hand corner of the check and bringing it out at the lower left-hand corner of the next check below, or toward you. (e) Take succeeding stitches in this order until the direction of the line of stitches must be changed. Start the new line just as you did the first one. The stitches on the wrong side run straight across the checks making a neat appearance.

2. The satin stitch is a close over-and-over stitch used to fill in the solid portion of a design. It is made as follows:

(a) Fasten the thread by taking two or three small running stitches in the space that is later to be covered by the satin stitch, bringing the needle

Fig. 19. SEWING BAGS
This type of bag requires no fine, tedious stitches

out on the line at one end of this space. (b) Take stitches over and over, inserting the needle on the line, carrying the thread across the space each time, and bringing the needle thru on the line, until the entire space is covered. Keep the stitches even at the edges and very near together. The stitches are usually taken in a straight line across the short way of the space. Satin stitch may or may not be padded with a layer of short stitches to make it stand out (fig. 18).

SEWING BAG

The bags shown in figure 19 are similar to the ones shown in figure 13, but they require less cloth and are made with coarse embroidery stitches.

1. Cut a piece of cloth about eight inches wide and about twenty-two inches long. The material should be fairly heavy, such as crash or denim.

2. Make a narrow turn to the wrong side on all the edges. Make a turn about two and one-half inches wide across the ends. Baste these hems in place.

3. Fasten the hems by means of a simple decorative stitch on the right side, such as the running stitch, the backstitch, the chainstitch, or couching. Make a second row of the same stitches in the hem three-fourths inch above the first row, to form a casing for the drawstring.

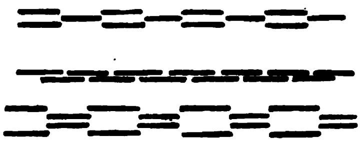


FIG. 20. DECORATIVE RUNNING STITCH, OR DARNING STITCH

4. Place the ends together, and fold the material in half. Pin and baste the sides together from the bottom to the lower edge of the casing. Finish the side seams with a blanket stitch or an overcasting stitch on the right side.

5. For a drawstring use a cord of the same color as the fancy stitches. This cord may be made by twisting several strands of the embroidery cotton together.

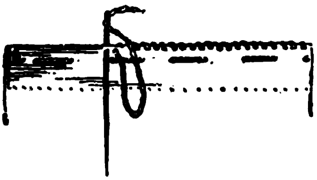


FIG. 21. OVERHANDING

DECORATIVE STITCHES

The running stitch, the overcasting stitch, the blanket stitch, couching, the chainstitch, and the backstitch may be used on this bag.

1. The decorative running stitch is sometimes called a darning stitch. It is made like the usual running stitch (fig. 7), except that it is larger and may consist of stitches of unequal length. Often several rows are used for the purpose of introducing pattern and color (fig. 20).

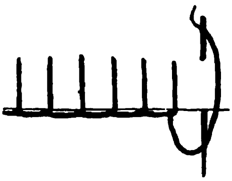


FIG. 22. BLANKET STITCH

FIG. 23. VARIATIONS OF BLANKET STITCH

2. The overcasting stitch is made from right to left over the edge of two layers of material. For decorative purposes or for finishing seams to prevent the cloth from raveling, the stitches are made fairly large (fig. 15). When made very small and close together, as in an overhanded patch or in the hem of a towel, they are called overhanding (fig. 21).

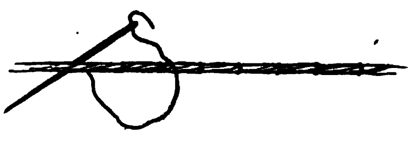


FIG. 24. COUCHING

3. The blanket stitch is used for finishing edges and is made as follows: (a) Fasten the thread with a knot. Take a stitch thru from the inside of the folds of cloth, in order to leave the knot inside, and bring the needle

out on the edge of the fold. (b) Hold the material over the forefinger of the left hand with the edge to be finished toward you. (c) Make the stitches from left to right and about one-fourth inch apart. The needle passes thru a loop of thread each time as it is drawn out, which causes the thread to lie along the edge (fig. 22). Variations of this stitch are shown in figure 23.

4. Couching is made by holding one or more threads down to a given line by means of stitches made over this thread or threads at equal distances apart. It may be used to hold down edges of hems or facings. (a) Fasten or cover all ends of threads carefully. (b) Make a stitch from one-fourth to one-half inch long on the under side and a very short one on the upper side, just long enough to cross the thread that is to be held down (fig. 24).

5. The chainstitch is in the form of the links of a chain. It should be very regular. (a) Hold the cloth over the forefinger of the left hand in such a way as to make the line of stitching come toward you. (b) Begin with a knot if it can be hidden; otherwise take three or four very short running stitches where they will come under the line of chainstitching. (c) To form the loop, put the needle in each time very near the point at which it came out, and bring it thru a loop of the thread (fig. 25).

Fig. 25. CHAINSTITCH

6. The backstitch is sometimes used for making seams by hand. It is very strong if short stitches are made. For decorative purposes, long stitches are made. (a) Fasten the thread. (b) Take a stitch as for a running stitch, bringing the needle out so that the stitch underneath will be twice as long as you wish it to be on top. (c) Put the needle in halfway back to the point where it went in the last time and exactly in line, bringing it out the same distance ahead each time. This forms a solid line of one thread on the right side. When made very small it has the appearance of machine stitching (fig. 26).

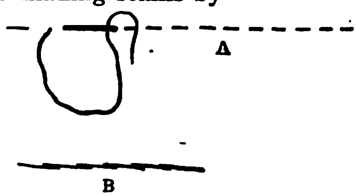


Fig. 26. BACKSTITCH
A, right side; B, wrong side

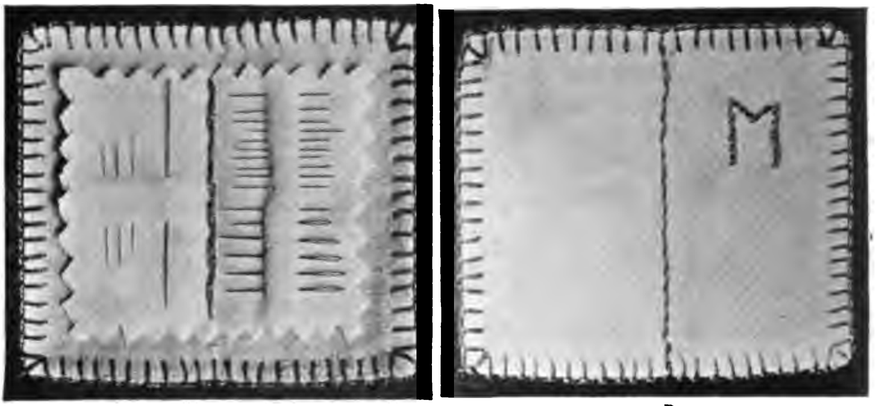
NEEDLEBOOK

A needlebook (fig. 27) is useful to all girls who sew. It requires only a small amount of material and gives opportunity for the use of two or more decorative hand stitches.

DIRECTIONS FOR MAKING A NEEDLEBOOK

Cut a piece of cloth four and one-half inches wide and six inches long for the cover. This cover should be firm and stiff; therefore choose a

material having these qualities if possible. Java canvas is good, but may not be available. Two layers of a less firm cloth may be used. Finish the edges of the cover with the overcasting stitch (fig. 15) or the blanket stitch (fig. 22), either of which will keep the edges from raveling. A border may be made inside this edge with running stitches (fig. 20). Cut two pieces of cloth three and one-half inches wide by five inches long for the leaves. This cloth should be soft, in order to hold the needles well, and should not ravel easily; flannel or some felted woolen cloth is good. Be careful that all colors used go together well (p. 9). To fasten the leaves in the cover, first lay the cover on a table and place the leaves on top of it with all the spaces around the edges even. Pin all



A B

FIG. 27. NEEDLEBOOK

A, the inside of the needlebook; B, the outside. This needlebook would make an ideal gift for one who enjoys sewing

the layers of cloth together near the corners. Make a line of backstitches (fig. 26) across the width of the book thru the center.

KITCHEN HOLDER

A kitchen holder is needed by any one who does cooking. Its use prevents the burning of towels and aprons in handling hot objects. It may be made by hand or by machine. Workers in Class A are expected to make it by hand (fig. 28). Workers in Class B should use it as a practice piece for their first machine work. The directions are the same in both cases with the exception of the last step. Workers in Class B will find their directions in *Elementary Garment Making*, which will be sent to them. Directions for Class A follow.

DIRECTIONS FOR MAKING A KITCHEN HOLDER

1. Use any firm wash material for the outside of the holder. Ticking, denim, jean, and galatea are good for this purpose. Dark colors are best. Outing flannel is the most satisfactory material for the lining, or inner layers.

2. Cut the material for the cover about twice as long as it is wide, thirteen inches by seven inches. Cut the lining ten inches long and five inches wide for this size.

3. Lay the piece for the cover on the table. Place the lining on this cover with the margins even, and baste it in place.

4. Turn in the edges about one-half inch all around, and baste this turn in place in such a way that the corners may be lapped together later and no raw edges exposed. To do this, crease from right to left on the upper side when the cloth is held in front of you. The beginning of the turn on the next corner each time will be on top except in the first one where you began. When you get back to this, bring it outside like the other three.

5. Fold this piece in half, and pin the two sides together, lapping or tucking in the corners in such a way as to have no raw edges exposed.

Fig. 28. KITCHEN HOLDER
Make your mother happy by presenting her with one of these holders

6. Baste the two parts together. The tape may be slipped under the corner at this time.

7. Overhand the three open sides together, or finish with the blanket stitch (fig. 28).

8. Tack the holder in four or five places by taking a short stitch thru all the layers of the cloth and tying the threads and cutting them close. This holds the lining in place.

APRON

There are few aprons suitable for girls that have not too much work on them to be made entirely by hand.

If a worker in Class A wishes to make an apron for an older person, one of the models on pages 29 to 33 may be chosen.

SUGGESTIONS AND DIRECTIONS FOR CLASS B HANDWORK

Project workers in Class B are asked first to do a small amount of handwork. Machine work is given more emphasis than handwork in the requirements for Class B, because it is considered more practical than hand sewing, except for necessary darning and patching and a few other kinds of sewing. A girl who has tried cannot fail to see the importance of mending in keeping clothes in good order. It is expected that project workers will choose to do a great deal more than the minimum requirement.

PATCHING

Some persons have thought that they must learn such sewing processes as darning and patching on samples or trial pieces. Consequently they spent time on useless work when they might have repaired a garment that needed it. Every opportunity should be taken to make stitches count, and all waste of time or materials should be avoided.

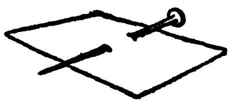


FIG. 29. MARKING THE POSITION OF A BUTTONHOLE

The patching required of workers in Class B is planned to give experience in making, first, the simplest patch, in plain white cotton material, and afterward a slightly more difficult one, in figured material. Directions for patching an undergarment or an apron are given on page 14.

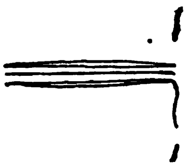


FIG. 30. STRANDING A BUTTONHOLE

DARNING

Only a small amount of darning is required of workers in Class B, six small holes in all, for it is wise to darn the first small hole in a stocking before it is a big task. "A stitch in time saves nine," is a good rule to remember. Directions for darning stockings are given on page 16.

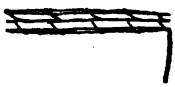


FIG. 31. OVERCASTING A BUTTONHOLE

BUTTONHOLES

The making of only six buttonholes is required. Some pupils may have already had experience in making buttonholes, or they may make fairly good ones after practicing the stitch for a short time. Therefore, altho it is not required to make these first six buttonholes in any garment, it is desirable to make them where they are needed.

DIRECTIONS FOR MAKING A BUTTONHOLE

1. Mark the position for the buttonhole with a pin, as shown in figure 29. The end of the buttonhole should be at least one-fourth inch from the edge of the garment.

2. Cut the buttonhole with buttonhole scissors, or insert the sharp points of ordinary scissors at one of the holes made by the pin in marking and cut along a thread of the cloth to the second pinhole. The buttonhole should be slightly longer than the width of the button.

3. Hold the buttonhole over the left forefinger with the edge of the garment toward the left.

4. With a fine needle and a single thread, strand the buttonhole as follows: Insert the needle at the right-hand end of the hole and a little above the edge of the cut. Bring it out across the end on the side toward you and at the same distance from the edge as it was inserted, leaving an end of thread one-half inch long. Carry the thread across the lower side of the buttonhole and take a stitch under the left-hand end of the hole in the same way as at the first end. Carry the thread across the upper side and take a stitch in the same hole with the first stitch. This strengthens the buttonhole (fig. 30).

5. The hole may be overcast with three or four stitches on a side (fig. 31), to prevent the edges from raveling. This is not necessary for all kinds of cloth.

6. Start the buttonhole stitch from right to left (fig. 32A). The stitches should be so near together that no space is left between. The purl on the edge is made by bringing the thread from the eye of the needle around the point of the needle after the needle is inserted in the cloth. Pull the thread directly toward you, until it is drawn thru all the way; then pull it up from the edge of the hole and draw it tight. This way of pulling the threads may prevent drawing the threads of the cloth out of place.

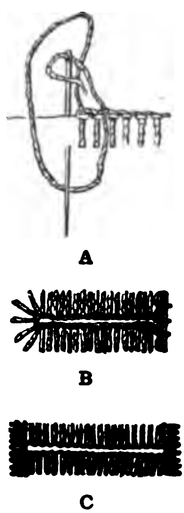


FIG. 32. A, BUTTONHOLE STITCH; B, BUTTONHOLE WITH FAN AND BAR; C, DOUBLE-BAR BUTTONHOLE

7. Continue the stitches around the hole, allowing them to form a sort of fan shape at the end opposite the beginning (fig. 32B). Fasten the thread with two short stitches across the first end or with a bar (fig. 32B). A bar may be used at both ends of a buttonhole (fig. 32C).

SEWING ON BUTTONS

Buttons are made with holes or with shanks. They are used for fastening and also for decoration. If a button has holes and is used for fastening, it should be given a sort of shank made of thread to allow room for the buttonhole underneath without puckering the cloth.

Some persons think that anybody can sew on a button, but there are good ways and poor ways of doing it. For the project requirements,

the buttons may be sewed on any garment on which they are needed, but directions should be followed and old ways improved if possible.

DIRECTIONS FOR SEWING ON A BUTTON

1. Fasten the thread where it will be covered by the button, either with a knot or by taking two or three short stitches over and over. If you wish a very neat appearance, use a single thread.

2. Take the needle out thru a hole of the button and back thru another hole and thru the cloth to the wrong side. Slip a pin between the two threads and between the button and the cloth in order to keep a space between the button and the cloth while you put in the remaining stitches.

3. Sew thru the button three or four times, and fasten the thread securely on the wrong side with three small stitches. Remove the pin. Various ways of placing the threads on the top of a four-holed button are shown in figure 33.

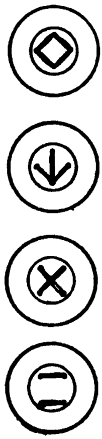


FIG. 33. METHODS OF SEWING ON A FOUR-HOLED BUTTON

BASTING

The only basting required in the project is whatever is needed for the machine work. It is important, however, that basting be done well; otherwise the time is wasted. No one likes to baste if it is not necessary. Often pins may be used successfully instead of basting; consequently project workers are left somewhat to their own judgment about when and where to baste. Experience is a good teacher.

Beginners need to baste more than do experienced sewers. The sooner a worker acquires skill in holding cloth under the machine, the sooner she can sew with little basting. Directions for basting are given on page 15.

HEMMING A TOWEL OR A SCARF

Material for a towel should be selected with care. It may be inexpensive crash for a dish towel or linen damask or huck for a hand towel. It may be natural-colored linen crash or other material suitable for a table runner or a scarf.

DIRECTIONS FOR MAKING A TOWEL OR A RUNNER

1. Make the length in good proportion for the width.

2. Allow for hems in proportion to the length of the towel or the runner, from one inch to two and one-half inches.

3. Straighten the ends of the cloth by drawing threads and cutting.

4. Crease a first turn one-fourth to three-eighths inch wide.

5. Measure a second turn by means of a cardboard gauge, and pin the hem in place.

6. Baste the hem with short stitches near the edge, being careful to match the ends of the hem exactly.

7. Turn the entire hem down to the right side, and make a crease at the edge of the hem.

8. Use a single thread about one-half yard long.

9. Take the first stitch from inside the hem, starting at the right-hand end. Take the stitches very near together and catch them into only a few threads of the cloth. This stitch is called overhanding (fig. 21), and the hem is called the napery hem.

10. Fasten the thread at the last end firmly, taking several small stitches in one place. Overhand together the ends of the hem; otherwise they will not lie together after laundering.

This towel or runner may be decorated with a simple border or an initial, but care should be taken not to overdecorate it.

SUGGESTIONS AND DIRECTIONS FOR CLASS C HANDWORK

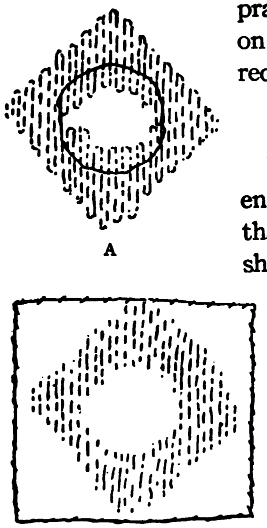
All the workers in the clothing project are required to do a small amount of handwork and some repair work. Workers in Classes B and C are asked to do more machine work than handwork. No course in sewing should ignore the importance of mending, however, especially at this time when materials and labor of all sorts must be conserved. On the other hand, for this same reason, no one can justify doing large amounts of handwork either in the form of decoration, which is a luxury, or in the form of the seemingly more practical sort, which can be done better and more quickly by machine.

Mothers who have thought it a waste of material to allow girls to learn to sew, have begun to realize that this is mistaken economy in the long run. Girls even ten years old learn to use patterns and sewing machines successfully. Girls should by all means persist in overcoming whatever obstacles they meet in sewing. They should learn as soon as possible to do their own mending and to make at least such simple garments as this project suggests.

MENDING

The problems in mending for Class C require more skill than those for Class B. Girls in Class C may already have had credit for the work of Class B. In this case it is reasonable to suppose that they are able to do more difficult work. If they have not done the work of Class B

they have a choice between Class B and Class C. They are older girls than those in Classes A and B and are more likely to have had some practice in such work. If necessary, they may begin on simpler problems and gradually work up to the requirements here given.



A

B

FIG. 34. DARNED PATCH

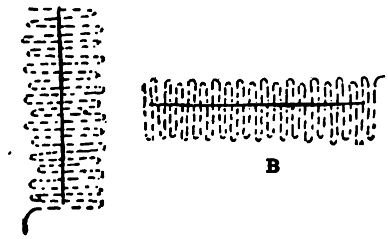
A, right side of patch; B, wrong side of patch

MENDING A FINE GARMENT

Mending a fine garment is not necessarily different from the patching described on page 14, except that smaller seams and stitches are necessary on the sheer, soft material.

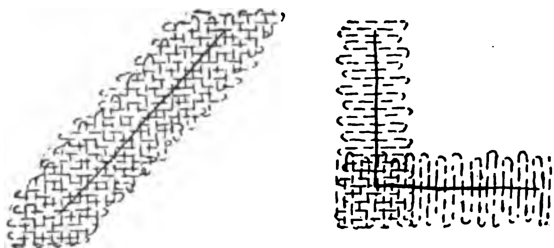
It is sometimes desirable to darn down a patch (fig. 34). To do this, cut the edge of the hole smooth or cut the hole square or oblong. Place the piece of cloth under the hole, and baste it in place in the same way as for the hemmed patch. Then instead of turning in the edges, darn back and forth across the raw edge of the hole on the right side with very small stitches until all the edges are firmly held down. The thread used should match the threads of the cloth as nearly as possible.

Another common way of mending a fine garment is to darn together the edges of a tear without using a patch (fig. 35).



B

A



C

D

FIG. 35. DARNING TEARS

A, a warp tear; B, a woof tear; C, a diagonal tear; D, a hedge, or corner, tear

MENDING A WOOLEN GARMENT

Any of the kinds of darns already described may be used in mending woolen material, the choice depending on the kind of hole to be mended (figs. 34 and 35).

APRONS

All clothing project workers in Class C are asked to make an apron by hand. Several types of aprons are suggested so that the individual may choose one that meets a real need. In

any case it is not desirable that a project worker should make a garment for the sake of learning stitches only, since one can learn all necessary and desirable stitches best by using them where they are needed. For this reason, no large apron is advised, and no material is suggested that does not lend itself well to hand stitches. Aprons that have a large pocket are especially adapted to use when sewing, knitting, or darning.

A commercial pattern similar to any of the designs shown here may be selected, but generally a girl can cut her own pattern. The type of material should be determined by the use to be made of the apron. Some of the best materials are: small-figured cretonne; fine white material, such as dimity, india linen, or lawn; and crash toweling. The edge of aprons made of sheer white material may be finished with narrow fine lace. Many decorative stitches (p. 20 and 21) are suitable for these aprons. They should be simple, however, and only such colors and kinds of decoration used as will go well with the material.

Fig. 36. GENERAL UTILITY APRON

GENERAL UTILITY APRON

A design for an apron often liked better than any other, is shown in figures 36 and 37. This apron is sometimes called a chafing dish or fudge apron. It is made of plain crash toweling about fifteen inches wide. Crash toweling that has a narrow blue or red border is as good as plain crash for this apron if the color in the border is carried out in the decorative stitches. About one and one-half yards of material is required, or the length from the waist line at the back over the shoulder and down to

FIG. 37. ANOTHER VIEW OF THE GENERAL UTILITY APRON SHOWN IN FIGURE 36

the knee plus about eight inches for the pocket section.

The two ends of this apron are finished in the same way as the combination apron, with a pocket section and a band. A hole is cut so that the apron may be slipped on over the head. This hole may be finished with a narrow hem or binding or with a decorative stitch. Decorative stitches are particularly effective on this type of apron. The stitch used on the apron shown in figures 36 and 37 is the decorative stitch shown in the top row of figure 29. The chainstitch is equally effective and suitable (fig. 25).

COMBINATION APRON

A combination apron, a favorite type, is shown in figure 38. Directions for making it are as follows:

1. Cut a piece of cloth about thirty inches long and twenty inches wide. The size should depend somewhat on the size of the person who is to wear the apron. Draw threads as a guide for cutting.

2. Allow eight inches on one end of this cloth for the row of pockets across the bottom. If there is no right nor wrong side to the cloth, the part for the pockets may simply be turned up on the right side of the apron. If

there is a right and a wrong side, cut off eight inches across the narrow end and sew it on with a french seam to make the right side of the cloth come on the outside of the pockets.

3. Make a hem about one-half inch wide across the top of the pocket section on the wrong side.

4. Pin this section in place.

5. Turn in the outer edges of the pocket section and the apron, and baste them together. Overhand these edges together (fig. 21).

FIG. 38. COMBINATION APRON

This apron gets its name from the fact that it serves both as an apron and as a bag for sewing and mending

6. Make a hem about one-fourth inch wide on the two sides of the apron above the pocket section.

7. Divide this pocket section into three equal parts, or make the center one a little wider than the other two. Run a line of stitches from the top to the bottom of the pocket section at the two division points. If the material is figured and the stitches will not be noticeable, plain running stitches may be used. If the material is plain, a decorative stitch, such as chainstitch (fig. 25), may be run on these lines and on the lower edge of the band.

8. Gather the top edge of the apron, and put it on a band (fig. 39).

SEWING APRON

Another good design for an apron is shown in figure 40. This apron is made of dimity and is very simple. It may have a pocket section similar to that on the combination apron. If so, the lower edge of this section is shaped to fit the bottom of the apron. The apron has a one-fourth-inch hem on the edges. Narrow lace, slightly full, is overhanded to the edge of the hem. The apron is put on a band in the same way as the combination apron. It may or may not have strings.

BAG

Girls in Class C may make one of the bags shown in figures 13 and 19 or a different kind, such as a knitting bag. In the latter case both design and material should be suited to a hand problem. The worker should make only the bag for which she has use.

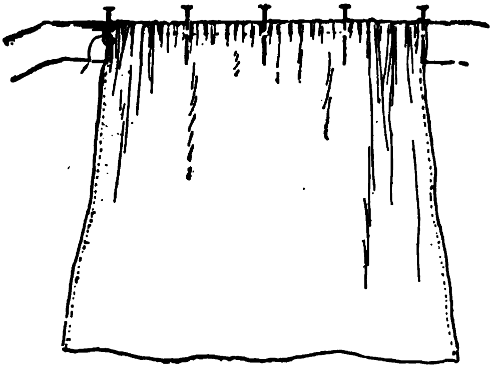


FIG. 39. GATHERS ADJUSTED TO A BAND

COLLAR

Workers in Class C may make a collar instead of a bag. Many girls wear cloth dresses in winter, and these usually need separate collars that may be laundered often. Such a collar is suitable also as a gift. Only a small amount of material is needed for it.

Patterns for a variety of separate collars may be obtained from a pattern company, but a girl can usually cut a pattern from a collar that she likes especially. Collar patterns are fairly easy to cut free hand. The neck line varies from a straight line, which makes a collar stand high up against the neck at the back, to one curved like the neck line of the waist, which makes the collar lie flat. The shape of the outside edge is a matter of choice. It is wise to cut patterns of paper and try them until a satisfactory one is found.

The collars shown in figure 41 are of the flat sailor style and are made of white flannel. Suitable thin white materials are organdy and flaxon; heavier ones are poplin and piqué.

A decorative stitch, such as chainstitch, couching, or running stitch, may be used to finish the edge of the collar. In this case the hem should be turned and basted, and held in place by the decorative stitch.

THE PROJECT NOTEBOOK

Every girl who does junior home project work should keep a notebook. By so doing she will have a permanent record of her work for future reference. It enables the teacher or the leader to direct work that is to be done at home or at school, such as reading, collection of illustrative material, story writing, and drawing.

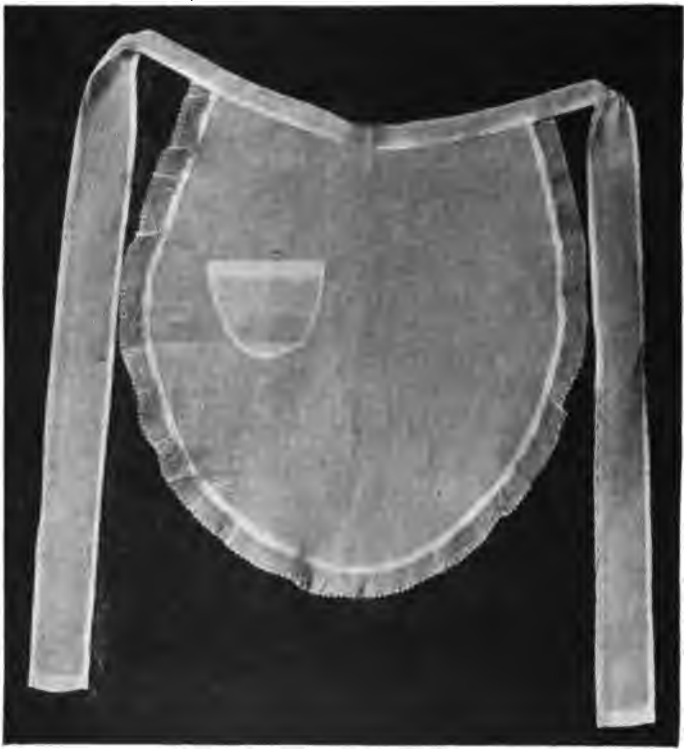


FIG. 40. SEWING APRON
One of the simplest aprons to cut and make

The notebook should be informal in character so that making it may not become tiresome. Each worker's ideas should be expressed simply and in her own way.

The notebook work should be carried along with the laboratory work, and each special topic treated in the order suggested in the requirements on page 38. The general topics may be used to suit the convenience of the student.

Answers to many questions on the subjects treated in the notebooks may be found under similar headings in this manual or in the suggested reference books.

NOTEBOOK FOR CLASS A

The following subjects are suggested for notebook work for Class A:

Mending.— Tell anything of interest about your experience with patching. Tell what you have darned. Do you expect to continue to do some darning?

Making a bag.— Write a description of the bag you have made. Name some other materials suitable for such a bag and mount a sample of each. Tell what stitches and what kind of seams you used in your bag. Had you used these before? If so, on what had you used them? Tell about any other article you have made. Why did you choose certain articles from the suggested list? Tell about any article made for somebody besides yourself.

FIG. 41. COLLARS
The girls who made these collars are now wearing them on their serge school dresses

Drawings.— Make drawings or tracings of articles that you have made or of similar things of which you have seen illustrations in books or elsewhere.

Pictures.— Mount any pictures that you can get that illustrate your work in sewing.

Machine work.— Have you done any machine sewing? If so, tell some interesting things you have learned about a sewing machine, for example, how to clean it or oil it or set a needle. Name the principal parts of a sewing machine. What difficulties did you meet in learning to use a machine?

Patterns.— Have you used a commercial pattern? Did you have help in learning how to use this pattern?

Cotton.— Tell what you know about cotton. This may be a very interesting story if you read about it in your reference books.

Wool.— Tell what you know about sheep and the making of wool into cloth.

Care of clothing.— Tell how you help your mother take care of your clothes; that is, whether you wash, iron, press, mend, or put them away carefully, or even make some of them.

Helping at home.— What are some of the other things that you do to help at home? What do you like best of all to do? Why? What do you like least to do?

Doll's clothes.— Tell about any doll's clothes that you have made.

NOTEBOOK FOR CLASS B

Suggestions for notebook work for Class B are as follows:

Reason for undertaking project work.— Tell why you think a girl should learn to sew.

Handwork.— What is your opinion of the value of hand sewing? What handwork have you done, such as knitting, crocheting, weaving, and embroidering? What use did you make of such work? Tell of your experience in learning to make buttonholes. Mount any small specimens of your work. Mount samples of materials suitable for towels, giving the price and the name. What are the characteristics of good materials for towels? What were some of the art problems in your handwork?

Textile fibers.— Name the fibers from which clothing materials are made. Make tracings from drawings of cotton and wool fibers as they appear under a microscope. Describe these fibers. (*Clothing and Health,* p. 7, 14, 205, 226.)

Cotton.— Write about cotton including the following topics: kind, where grown, how cultivated, how picked, ginning, baling, marketing, opening, cleaning, carding, combing, spinning, weaving, dyeing, bleaching, scarcity, value, by-products, substitutes, and adulterations. (*Clothing and Health,* p. 11-15.)

Care and use of the sewing machine.— Give directions for cleaning and oiling a sewing machine, in your own words and from your own experience. Tell of the importance of such care of your machine. Tell of your experience in learning to use a machine. Do you prefer machine work to hand sewing? Why? Tell some important points to be observed in using a machine.

Patterns.— How did you learn to use your first pattern? Tell what patterns you have used and what success you have had.

Choice of material.— Tell of your experience in selecting material for your apron. What did you learn from this experience? Tell the characteristics of good apron material. Did you use any tests on your material? If so, tell about them. Mount samples of apron materials which you have collected. What do you know about colors suitable for an apron?

Color.— What colors are most becoming to you? Why? Should a person buy what she at first thinks that she likes, or should she learn to like the colors that are best for her (p. 9 to 12)?

Cost.— Estimate the cost of the garments you have made. Compare these garments with ready-made ones in price, in quality of material for laundering, wearing, and appearance, and in quality of workmanship for wearing and appearance.

Samples.— Mount at least three samples of material for underwear, giving the price and the name. Make a collection of all the common

cotton materials that you can find, and learn their names. Tell what they are most suitable for.

Seams.— Name and describe the seams that you have learned to make. Tell when or where you would use each kind.

Trimming.— Make a collection of samples of as many kinds of laces and embroideries as possible. Name them and tell what they are suitable for. Name the principal characteristics of good laces and embroideries. (*Clothing and Health*, p. 93-98.)

Hygiene.— Discuss the relation of clothing, including underwear, shoes, and corsets, to health (p. 8).

Care of clothing.— Tell what you have learned about laundering, cleaning, pressing, remodeling, and repairing clothing, after reading references on these topics.

NOTEBOOK FOR CLASS C

Students in Class C should follow suggestions for Classes A and B, but since they have had more experience with notebook work, they may be allowed more independence. Many other subjects for study suggested in the circulars, bulletins, and books, may be treated in a similar manner.

Information gained from the worker's own experience is the most valuable, and individuality should be a feature of this notebook.

REFERENCES

Free bulletins and leaflets may be obtained that contain valuable information concerning this clothing project work. A list of such publications is not given here because new ones are constantly appearing and the old ones are becoming unavailable. The best of the available bulletins will either be sent to the project students or be referred to in a special circular.

All the following books should be available in the school library. In case not all can be procured, it is suggested to the teacher that they be obtained in the order listed. If possible, every project student should own one of these books.

Clothing and health. Helen Kinne and Anna M. Cooley. The Macmillan Company, New York City. Price 65 cents.

Textiles. William H. Dooley. D. C. Heath and Company, New York City. Price $1.36.

Shelter and clothing. Helen Kinne and Anna M. Cooley. The Macmillan Company, New York City. Price $1.10.

Costume design and home planning. Estelle Peel Izor. Atkinson, Mentzer and Company, New York City. Price 90 cents.

GENERAL REQUIREMENTS FOR THE JUNIOR HOME PROJECT IN CLOTHING

The requirements for the home project work are changed from time to time as new needs develop. A worker may finish her project according to the requirement under which she begins, or she may change to meet a later requirement if it seems desirable.

AGE REQUIREMENTS

Any girl in New York State under twenty years of age may undertake the clothing project. For purposes of study and to insure a more equitable basis of awards in all contest work, the project is divided into three classes according to the ages of the project workers, as follows:

CLASS A	CLASS B	CLASS C
Up to 11 years inclusive	12 to 15 years inclusive	16 to 19 years inclusive

Any girl placed in Class A or Class B because of age, may undertake work in the next class if she obtains the consent of the teacher or the local leader in charge of the work.

MINIMUM REQUIREMENTS OF WORK

REQUIREMENTS FOR CLASS A

The requirements for Class A are at least four pieces of work as follows:

HANDWORK

Making a patch
Darning a stocking
Making a bag
Making a needlebook or a kitchen holder or an apron

REQUIREMENTS FOR CLASS B

The requirements for Class B are the completion of the following work: four kinds of handwork, four pieces of machine work, and at least six darns and two patches.

HANDWORK

Hemming a towel
Sewing on six buttons
Making six buttonholes
Basting for machine work

MACHINE WORK

Making a kitchen holder
Making a kimono apron
Making a chemise, or princess slip, or a corset cover or bloomers
Making a nightgown or a kimono or a cooking apron

REPAIR WORK

Darning three pairs of stockings
Patching an undergarment
Patching an apron

REQUIREMENTS FOR CLASS C

The requirements for Class C are the completion of two pieces of handwork, three machine-made garments, and two pieces of mending.

HANDWORK

Making an apron
Making a bag or a collar

MACHINE WORK

Making a middy blouse
Making a waist or a skirt
Making a one-piece wash dress

REPAIR WORK

Mending a woolen garment
Mending a fine garment

ENROLLMENT

The student should enroll for the project with the teacher, the project leader, or the superintendent of schools, who will forward her name and other necessary information to the State Leader of Junior Extension.

RECORDS

An accurate and up-to-date record of the project should be kept on the special blanks provided for that purpose. When the project is completed, a special summary sheet or card will be sent to the student to be filled out and given to the project leader or to be sent direct to the State Leader of Junior Extension.

NOTEBOOKS

The notebook should contain in the worker's own language, the results of her observation, study, and experience, as related to her project. The

notebook outline in this bulletin may be used as it is given, or it may be modified by the local leader or the teacher.

EXHIBIT

An exhibit of the project work may be required. The time and the place will be specified by the project leader.

BASIS OF AWARDS

The awards in all clothing project contests in which prizes are offered should be based on the following score:

CLASS A

Best exhibit of handwork (one specimen in each of the four groups, 25)	100

CLASS B

Best exhibit, one specimen of handwork	20
Best exhibit, one specimen of machine work	40
Best exhibit, one specimen of repair work	20
Best project report	20
Possible score	100

CLASS C

Best exhibit, one specimen of handwork	20
Best exhibit, one specimen of machine work	40
Best exhibit, one specimen of repair work	20
Best project report	20
Possible score	100

RECORD FOR CLOTHING PROJECT

Make the record at the time the work is done

Class	Articles made	Kinds of material	Amount of material	Cost of material	Time spent in making garments	Value of labor at 15 cents an hour	Total cost of garment	Estimated value at local store

RECORD FOR CLOTHING PROJECT

Sketch at least two of the articles made

1	2	3	4

RECORD FOR CLOTHING PROJECT

(Make the record at the time the work is done.)

Name the articles you have made for this project..

....

....

....

What articles had you made before beginning this project?........................

....

....

....

What kinds of trimmings have you used?..

....

....

Name the different materials you have used..

....

....

What materials did you select and buy for yourself?....................................

....

....

Name the different patterns you have used..

....

What kind of sewing machine have you used?...

Have you cleaned and oiled it?..................Have you set a needle?..........

What garments have you made over? ....

What articles have you made for any one other than yourself?

....

What kinds of stitches have you learned to make?..

....

....

What kinds of seams have you learned to make?...

....

What books on clothing or sewing have you read or used for reference?

....

....

....

What help have you received on your project work from your mother or other persons?...

....

....

....

What are the most valuable and helpful things you have learned from this project?..

....

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ELEMENTARY GARMENT MAKING

A MANUAL FOR JUNIOR EXTENSION WORKERS IN CLOTHING

GARMENT MAKERS WHO DID RELIEF WORK DURING THE WAR

NEW YORK STATE COLLEGE OF AGRICULTURE, UNITED STATES DEPARTMENT OF AGRICULTURE, NEW YORK STATE DEPARTMENT OF EDUCATION, COOPERATING

Published and distributed in futherance of the purposes provided for in the
Act of Congress of May 8, 1914

1971

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ELEMENTARY GARMENT MAKING

Nancy Hill McNeal

This manual is intended for use by workers in Class B and Class C of the junior home project in clothing, and contains suggestions and directions for making simple serviceable garments. The handwork required in Class B and Class C is explained in *First Lessons in Sewing*, Cornell Junior Extension Bulletin 1, which also contains directions for the use and care of the sewing machine as well as a general discussion of color and design and hygiene of clothing. It is expected that workers in Class B and Class C will have spent some time in studying materials suitable for the garments that they intend to make and in learning to use commercial patterns, before they receive this manual on garment making.

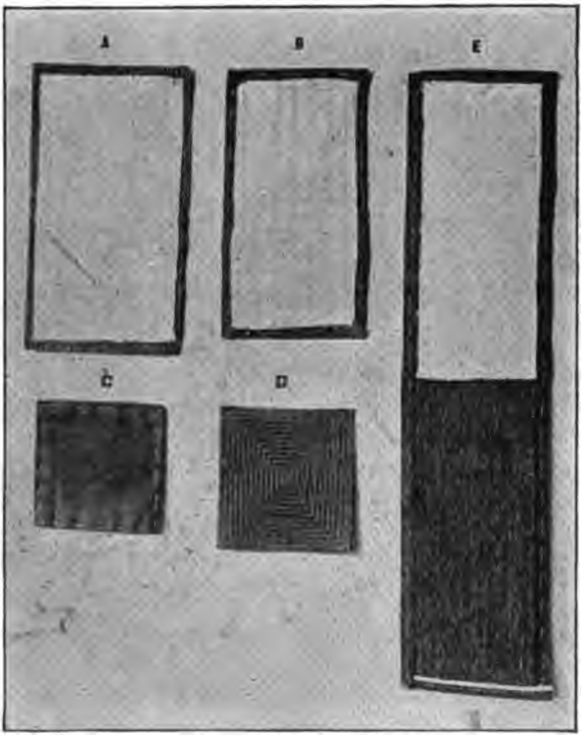

Fig. 42. MACHINE-MADE KITCHEN HOLDER

A, lining basted to cover; B, edges turned down; C, strip folded in half and basted; D, stitched and completed holder; E, strip twice the length of B for a heavier holder

SUGGESTIONS AND DIRECTIONS FOR CLASS B MACHINE WORK

KITCHEN HOLDER

Directions for making a kitchen holder by hand are given in *First Lessons in Sewing* (p. 23). To make a holder by machine, the same directions may be followed to the point of overhanding the edges, the last process.

Instead of finishing the edges by hand, stitch the holder as shown in figure 42. The first row around the holder gives practice in stitching very

near the edge. The space between the remaining rows is about one-fourth inch and is measured by the edge of the presser foot. The holder is a good problem for a person beginning to use the machine. Many workers make several of these holders because they offer excellent practice and are useful in any kitchen.

KIMONO APRON

A kimono apron has proved to be such a favorite garment with workers in Class B of the clothing project that it is no longer necessary to offer a choice in this part of the requirement. This apron is attractive, especially when made of a combination of two materials. Since it is cut in one piece and slips on over the head, it is very simple in construction.

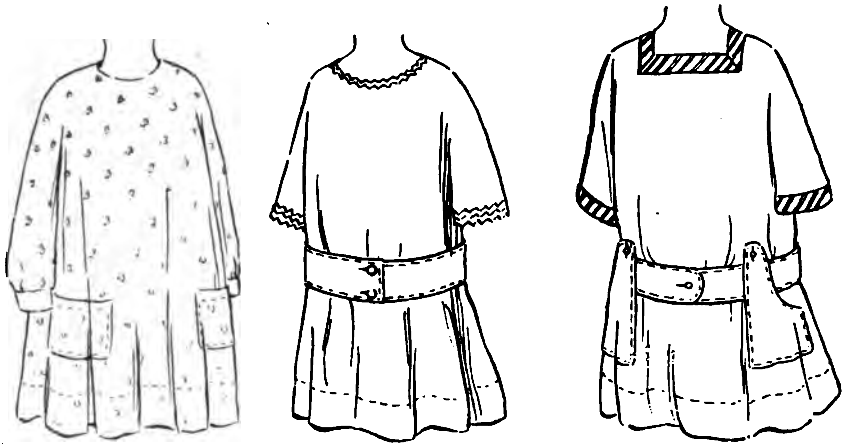

FIG. 43. DESIGNS FOR A KIMONO APRON

A kimono apron is a good model for a school dress for girls and also is suitable for a house dress for older persons.

Pattern.— Any good commercial pattern may be used. All pattern manufacturers show designs similar to those in figure 43, from which choice may be made.

Material.— Workers should make a collection of samples of materials suitable for this apron from all possible sources. They may then compare and discuss intelligently the advantages of one material over another for durability, laundering qualities, design, and color. Gingham and percale are perhaps the best materials for this apron. The material should be of modest color, and any design, such as check, plaid, stripes, or figure, should be inconspicuous. A particularly pleasing combination of materials is shown in figure 44.

FIG. 44. KIMONO APRON OF BLUE AND WHITE CHECKED GINGHAM TRIMMED WITH PLAIN BLUE, A PLEASING COMBINATION OF MATERIALS

The amount of material needed for the plain apron is about twice the length from the top of the shoulder of the person to the bottom of the dress, plus twice the hem allowance. This amount does not allow for a belt. One-half yard of contrasting material is required if a yoke and sleeve facings are used as shown in figure 44.

Trimming.— If a combination of figured and plain material is used (fig. 44), no other trimming is needed. If the apron is made entirely of one material, a narrow finishing braid may be used for decoration on sleeves, neck edge, and pockets. In case some handwork is desired, decorative stitches may be used on the edges of neck, sleeves, and pocket facings (fig. 45).

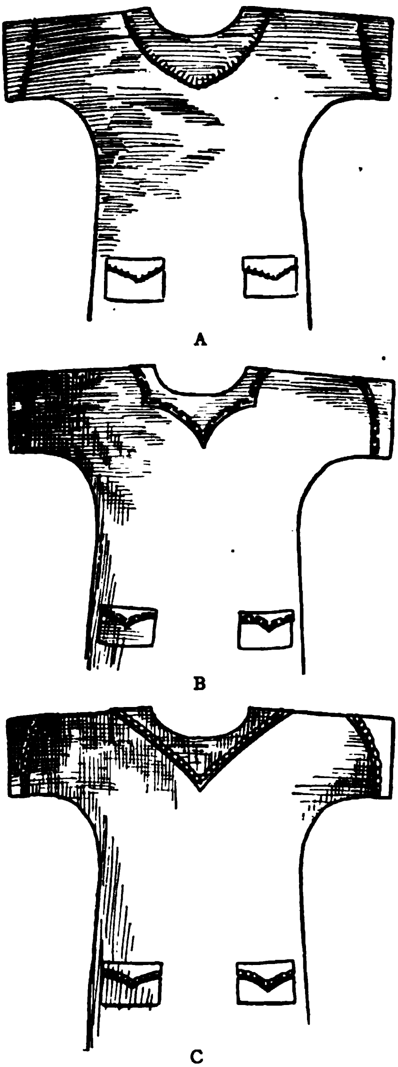

FIG. 45. DECORATIVE STITCHES SUITABLE FOR THE YOKE AND SLEEVE FACINGS OF A KIMONO APRON

A, blanket stitch; B, darning stitch; C, chain-stitch

Cutting the apron.— If a chart for placing the pattern on the cloth accompanies the pattern, it should be followed. The cloth should be doubled for cutting.

Take the length from the top of the shoulder of the person to the bottom of the dress. Measure this length on the pattern from the top of the shoulder, and make necessary alterations in the length of the pattern. Allow at least three inches for the hem at the bottom, both back and front.

This apron does not require a placket; none need be cut even if the pattern suggests it.

After the apron is cut, it should be tried on to see whether the neck opening is large enough to slip over the head easily. If it is not, it should be cut larger. Care should be used, however, not to cut it larger than necessary and thus make the neck too low.

If a yoke and sleeve facings are desired and are not included in the commercial pattern, special patterns may be made as follows (fig. 47): Cut a piece of paper about fourteen inches square. Fold it in half. On the folded edge of the paper, cut the neck opening the same size as in the cloth, using the cloth as a pattern. Cut the outer edge of the paper pattern any desired shape. Cut the yoke in cloth from this prepared pattern.

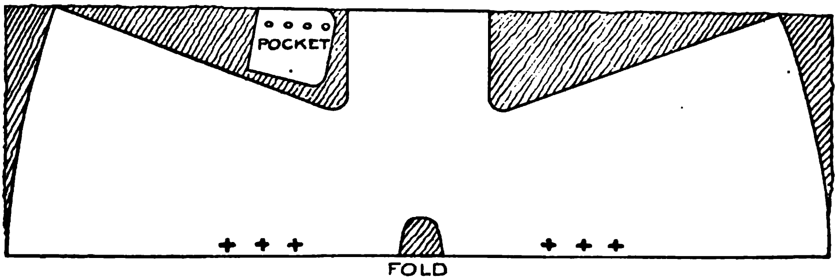

FIG. 46. CHART FOR CUTTING A KIMONO APRON
Fold the cloth lengthwise and place the pattern as shown here

Making the apron.— Pin the yoke facing to the wrong side of the apron with the neck edges even, and baste it. After trying on the apron to be sure that the neck size is right, stitch a seam around the neck. Slash the seam almost to the stitching, being careful not to cut the stitching (fig. 48).

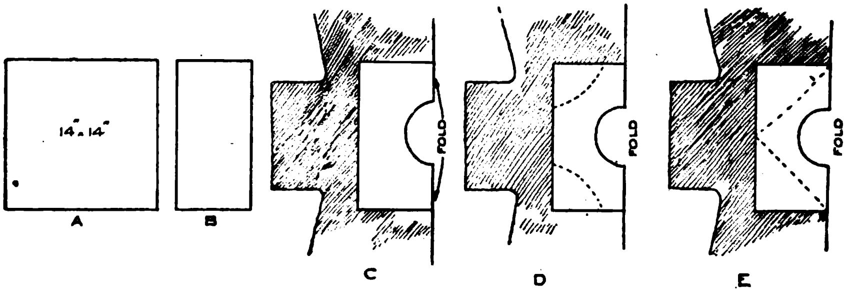

FIG. 47. METHOD OF CUTTING A PATTERN FOR A YOKE FACING FOR A KIMONO APRON
A, square of paper; B, square of paper folded in half; C, paper applied to the apron, and neck opening cut out; D and E, designs for yoke marked on the paper pattern

Turn the facing thru the neck opening on the right side. Crease a one-fourth inch turn to the wrong side around the edge of the yoke. Baste the yoke to the apron, and stitch it near the edge to hold it in place (fig. 49). Apply the sleeve facings in the same way as the yoke.

Pin and baste the underarm and sleeve edges for french seams. A french seam is made by first sewing a plain seam on the right side of the

garment, trimming this seam to about one-eighth inch, turning it to bring the two right sides of the cloth together, creasing it well, basting it near the edge, and stitching it on the wrong side just far enough from the edge to completely enclose the first seam.

FIG. 48. METHOD OF SLASHING THE NECK SEAM OF A KIMONO APRON

Match the edges at the bottom of the sleeve carefully, and retrace the stitching at this point to make it very strong. To do this, start about one inch from the end of the sleeve, stitch to the end, turn around and stitch back over the same line and on down the seam. The edges of the seam may not come out even at the bottom of the apron. If they do not, trim them even.

Make a one-fourth inch turn to the wrong side around the bottom, make another turn the width allowed for the hem, using a cardboard gauge. Lay the fullness at the top of the hem in small pleats. Baste the hem in place, and stitch it near the edge.

If pockets are used, they must be made and put on the apron before the underarm seams are sewed. The pattern shows the place for them.

Narrow straps may be used at the underarm seams to hold the belt in place. The belt may be fastened with clasps or with hook and eye, or it may have button and buttonhole.

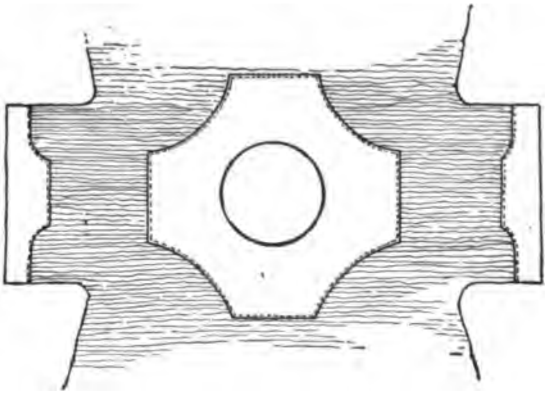

FIG. 49. NECK AND SLEEVE FACINGS APPLIED TO THE APRON

This should be done before the underarm seams are made

CHEMISE, OR PRINCESS SLIP

The chemise is a simple garment that takes the place of both an underwaist, or corset cover, and a petticoat. The style called envelop chemise is designed to take the place of an underwaist and drawers. Princess slip is simply another name for chemise.

This garment requires no buttonholes, buttons, band, nor placket. Besides being simple in construction, it is comfortable and graceful and adapted to present-day models of girls' and women's outer garments.

Pattern.— The pattern for a chemise, or princess slip, may be selected from any available fashion book: Suggestions for a good model may be

found in figures 50 and 51. The size of the pattern should be determined by the age of the girl.

Materials.— Longcloth, berkeley cambric, nainsook, and muslin are the most desirable materials for a chemise. A firm material is more easily handled and if of good quality will be more durable than one of lighter weight. For this reason unbleached muslin is good.

The amount of material needed is stated on the envelop containing the pattern, or it may be reckoned as follows: the length from the top of the shoulder of the person to the bottom of the dress, plus the amount desired for a hem and for letting down, multiplied by two.

FIG. 50. CHEMISE MADE OF UNBLEACHED MUSLIN

The neck and the armholes are finished with narrow braid. The bottom is finished with a plain hem

Trimming.— The chemise may be made with no trimming at all. There is often greater beauty in a plain, well-made garment than in an elaborately trimmed one. A very simple but attractive trimming may consist of a line of chainstitching or featherstitching in white at the edges of facings or hems, top and bottom. Narrow lace or embroidery edging is also suitable. Lace should be of a kind that will wear well; torchon, tatting, or crochet is suitable for the heavier materials, and round-mesh valenciennes for the finer materials (fig. 52). Embroidery made on material that matches the material of the garment as nearly as possible should be used. It should have a firm, well-made edge and should be simple in design. Elaborate and showy decoration is not in good taste on undergarments. The amount of trimming needed may be determined from the suggestion on the pattern envelop or by measuring rather loosely around the neck, the armholes, and the bottom, and allowing about six inches additional for seams.

To cut the chemise, or slip.— Always read carefully the directions on the pattern envelop. Place the pattern on the cloth in the same way as for the kimono apron (fig. 46) or according to the chart on the pattern envelop. Pin the pattern in place. Cut smooth edges.

To make the chemise, or slip.— Pin the underarm and shoulder edges of front and back together with notches matching. Place the pins perpendicular to the edge of the cloth, and about an inch from the edge. Pins placed in this manner will cause no fullness in the edge and will not be in the way of the machine stitching. No basting should be necessary if you watch the edges carefully and hold them together well as you stitch. Make french seams, as explained on pages 51 and 52. Try on the slip. Note the size of the armholes and the neck. The only alteration likely to be necessary is in the size of the neck. It may or may not need gathering. If gathers are not necessary, the edge may be finished with a very narrow hem, a facing, or a binding. Lace may then be overhanded or stitched on the edge of this hem, facing, or binding.

FIG. 51. CHEMISE MADE OF BERKELEY CAMBRIC

The neck and the armholes are finished with torchon lace. The bottom is finished with a flounce of embroidery

If there is extra fullness, it may be taken care of in one of two ways: (1) Finish the neck edge with a binding or a facing as already suggested, but make it wide enough to use as a casing for a drawstring. (2) Gather the edges for a few inches each side of the center front and if necessary each side of the center back. Then bind or face this edge. This will hold the gathers in place. Embroidery may be used as a facing.

The bottom of the slip may be finished with a plain wide hem, or with a narrow hem with lace overhanded to the edge, or with a facing or flounce of embroidery (figs. 50 and 51).

Finishing edges with embroidery.— Embroidery may be applied as a facing in the following way. Allow the design edge to extend beyond the edge of the cloth. Cut away the material from three-eighths to five-eighths inch from the design. Baste the embroidery to the cloth with the right sides together and the raw edge of the embroidery extending one-fourth inch beyond the edge of the cloth. Make the joining at the center front

of the neck and at the underarm seams. Stitch from one-eighth to one-fourth inch from the design of the embroidery. If the embroidery side is uppermost on the machine, the presser foot may act as a gauge. Trim the seams if necessary. Turn in the raw edge of the embroidery about one-eighth inch. Crease it, baste it down, and stitch along the edge.

CORSET COVER

A corset cover may be made to slip on over the head by using an elastic or a drawstring at the waist line. Or it may have a center front opening and be finished at the bottom with a peplum. This finish is preferred by some persons since it does not allow the corset cover to slip up. A gap between bands at the waist line is undesirable.

Pattern.— Use any simple, commercial pattern, determining the size by the bust measure of the person for whom the garment is made.

Materials.— The same materials and trimmings suggested for the chemise are suitable for the corset cover. The amount of material called for in the pattern should be bought.

To cut the corset cover.— Follow the directions on the pattern envelop for cutting the corset cover.

To make the corset cover.— Hem the front edges as the notches indicate. Make french seams on the shoulders and under the arms. Finish the neck and the armholes in the same way as on the chemise.

FIG. 52. LACES SUITABLE FOR TRIMMING UNDERWEAR

Beginning at the top: torchon; German, or round-mesh, valenciennes; French valenciennes; crochet

The bottom may be finished with a band, or a peplum and a band, or a peplum set directly on the bottom of the corset cover. For a peplum without a band, make a plain seam on the right side, and cover it with a narrow band of material or a tape. Buttons and buttonholes should be used for the front fastening.

BLOOMERS

Many girls have asked to make bloomers as a part of their clothing project work because they need bloomers for physical training. To be able to meet a real need in this way indicates the value of the work.

In many schools where advice is given to mothers concerning the best types of school clothing for their girls, bloomers are recommended strongly as the best garment for girls of all ages, to replace drawers in some cases and a petticoat in others.

Bloomers are simple in construction, easily laundered, and when made of colored material to match the dress they show soil less than do white undergarments. Their greatest advantage, perhaps, is that they are inconspicuous and comfortable.

Pattern.— Any commercial pattern of proper size for the girl may be used. The choice of design depends on the use. Bloomers for physical training are generally fuller than those used as undergarments, and are either pleated or gathered. The simpler ones for general wear are either gathered or circular at the top (fig. 53).

FIG. 53. BLOOMERS SUITABLE FOR GENERAL WEAR

They are most satisfactory when made of material the same color as the dress or the skirt with which they are to be worn

Materials.—Sateen is well adapted for dark bloomers for physical training or for wear under woolen dresses. Material like that of the dress or the apron with which the bloomers are to be worn is best for general use; it may be gingham, chambray, junior cloth, poplin, and the like. It is important to use durable material that will stand laundering and match the outside garment as nearly as possible.

Bloomers should not be trimmed. They should be finished at the bottom with a plain hem into which elastic is run, or they should be gathered into a narrow plain band at the knee.

To cut the bloomers.— Place the pattern according to the chart on the pattern envelop. Cut smooth edges.

To make the bloomers.— Read the directions on the pattern envelop. Make the plackets first, as follows: Cut a strip one and three-fourths inches wide and twice the length of the placket opening plus one inch. Baste this strip around the placket opening on the wrong side, spreading the opening until it is a straight line. At the lower end of the placket opening allow the edge of the garment to slip down gradually below the edge of the strip so that the stitching barely catches a few threads of the cloth of the garment while the seam remains the same width on the edge of the strip

(fig. 54). Stitch this seam about one-fourth inch wide. Crease the strip sharply away from the edge of the garment. Crease a narrow turn on the free edge of the strip toward the seam. Crease the strip thru the center so that this free edge will cover the first stitching. Baste the strip to the garment, and stitch it very near the edge.

KIMONO

Every girl should possess a kimono. It should be worn, however, only at such times as it is really suitable. A kimono is very simple in construction. It may be made of interesting materials with bright colors and less formal designs than are used for a garment that is to be worn outside the bedroom.

Pattern.— A very simple pattern should be chosen (fig. 55).

Materials.— Many interesting materials are suitable for kimonos. Cotton crêpe may be used if care is taken in selecting a piece that does not stretch too much. It is not safe to buy the cheaper cotton crêpe without first washing a sample to find out whether the color is fast. Japanese crêpe is the best of the cotton crêpes but more expensive than the domestic kinds. Gingham may be used for a kimono. It should be somewhat unusual in color and design, that is, not so dull or plain as would be used for an apron. Some good designs come in stripes of two or three light shades of color. Some woolen and silk materials are suitable for kimonos, but these are too difficult for beginners to handle and probably too expensive.

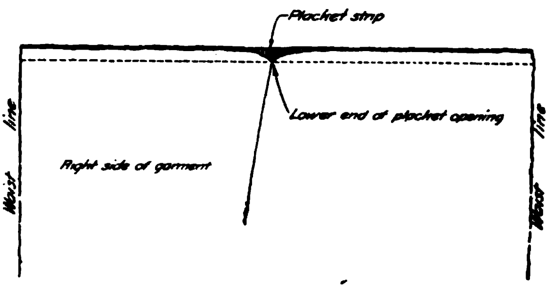

FIG. 54. METHOD OF MAKING A SIMPLE STRONG PLACKET

Trimming.— The only trimming needed on the crêpe or the gingham kimono is a fold on the neck and sleeve edges. It should be of a plain color to match some color in the material used for the garment. Sateen may be used on crêpe for this fold, and gingham or chambray on gingham.

To cut the kimono.— The kimono should be about ankle length when finished. Measure the pattern from the shoulder to the bottom and compare it with the length from the top of your shoulder to your ankle. Allow about three inches for a hem. Place the pattern on the cloth according to the chart on the pattern envelop. Note carefully which edges are to be cut.

The fold for the trimming should be a band about two inches wide when finished. A band should be cut about four and one-half inches wide and straight with a thread and crosswise of the material. A sufficient number of strips should be cut for the length around the neck, down both sides of the front, and around the bottom of the sleeves. Sew the strips together for the fold.

To make the kimono.— Put the fold on the bottom of the sleeves first, then around the neck and down the fronts. Place the right side of the fold to the wrong side of the kimono. Baste and stitch a seam about one-fourth inch wide. Crease the seam flat on the fold. Make a narrow turn on the free edge of the fold. Make another turn so that this edge of the fold just covers the first stitching. Baste it carefully, and stitch it very near the edge.

The only difficulty likely to be encountered in putting on this fold is that the last edge of the fold may appear too large or full for the space into which it must fit. The way to overcome this difficulty is to pin the fold in place all the way round, leaving the fullness equally distributed. Do the same when basting it. Stretch the underneath seam as you sew, and in this way take up the fullness as you stitch the fold on, rather than let it accumulate ahead of the needle. No pleats will be needed to take care of the fullness if these suggestions are followed.

After the folds are on the sleeve and neck edges, make french seams under the arms. Be especially careful to match the edges at the bottom of the sleeves. Retrace the stitching at that point to fasten it securely. Put the kimono on, and have some one mark an even length from the floor by a row of pins, using a ruler for measuring (fig. 55). Two workers should help each other at such a time whenever it is possible. Turn a hem as usual, and stitch it in place.

NIGHTGOWN

The nightgown is a simple garment that can be made very attractive in appearance. Many project workers have chosen to make it.

Pattern.— In selecting a pattern for a nightgown it should be remembered that some styles of nightgowns are much simpler in construction than others. A kimono gown requires less work than one with set-in sleeves. Especially in lightweight materials and for summer wear, most persons find the kimono gown satisfactory (fig. 57). The sack gown is a good practical kind and has advantages in wearing quality (fig. 56). The size of the pattern is determined by the age of the girl.

Materials.— Cambric, longcloth, nainsook, unbleached muslin, and outing flannel are the most satisfactory materials for nightgowns.

FIG. 55. MEASURING AND MARKING THE LENGTH FOR A KIMONO

This kimono is made of striped cotton crêpe. The trimming is a sateen fold of the same color as one of the stripes

FIG. 56. OUTING FLANNEL SACK GOWN. SUITABLE FOR WINTER WEAR

Trimming.— Trimming for nightgowns should be very simple and durable. A narrow edge of embroidery or lace on the neck edge and sleeves is in good taste. Torchon, cluny, and crochet laces are the most desirable kinds for the heavier materials (fig. 52). Valenciennes lace may be used on nainsook, if a very dainty garment is desired. If embroidery is used, great care should be taken in selecting a firm, closely made edge, also in having the material of the embroidery match the material of the garment.

To cut the nightgown.— Measure from the top of the shoulder to the floor, and make the length of the pattern according to this measure, allowing about one inch for shrinkage. Allow also from one and one-half to three inches for the hem at the bottom. Place the pattern on the cloth by the chart on the pattern envelop. Read all directions before cutting the material.

To make the nightgown.— If a kimono gown is chosen, make french seams under the arms. The neck and the lower edge of the sleeves may be finished in any of the ways described for the chemise (p. 54).

If a sack gown is chosen, the method is slightly different. There may be a yoke, which should be set on before any seams are sewed. The neck may be finished with a facing, or it

may have a collar joined with a facing. The sleeves may be finished at the hand with a narrow band before the seam is made. They may be sewed into the armhole with a flat felled seam (p. 63). The sleeve seam may be continuous with the underarm seam. This type of gown usually requires buttons and buttonholes for fastening, which necessitates a placket.

Make a hem at the bottom.

COOKING APRON

Girls in Class B may choose to make a cooking apron instead of a nightgown or a kimono. The cooking apron should be simple in style so that it can be slipped on quickly and laundered easily, for the clothing should be very clean when food is being handled. One of the best models for this apron is shown in figure 58.

Pattern.—A pattern may be selected from any pattern book, or any good one with which you are familiar may be used. The style should be very simple. Many girls have cut a pattern freehand after looking at the apron shown in figure 58.

Material.—The apron shown in figure 58 is made of white muslin. A white apron is not the most practical kind for cooking; this is a good one to use while waiting on the table.

Fig. 57. KIMONO GOWN OF LIGHTWEIGHT UNBLEACHED MUSLIN, SUITABLE FOR SUMMER WEAR

FIG. 58. COOKING APRON

This type of apron covers the dress well and is easy to make and launder

Cooking aprons are usually made of gingham, because it wears well and is among the least expensive materials. No better chance can be found for using old material than in this apron. Flour sacks or the best parts of worn dresses may be used in this way.

Trimming.—A cooking apron is not a garment to be trimmed. However, if a white apron is made for waiting on the table, a finishing braid with a little scallop may be used as a facing to finish the neck and sleeve edges.

To cut the apron.— There is little chance for any mistake in cutting this apron, since the pattern is simple. The apron should be sufficiently long to come to the bottom of the dress.

To make the apron.—Hem the apron at the bottom and on the sides. If the corners are cut round, a hem about one-fourth inch wide may be made all the way around the sides and bottom. This is an outward curve. The neck and sleeve edges are inward curves and consequently cannot be hemmed so easily. They may be bound or faced like the chemise.

The straps across the back are buttoned to the apron at the waist line. The corners of the apron may be buttoned, or tied with tapes, or fastened with a hook and eye.

SUGGESTIONS AND DIRECTIONS FOR CLASS C MACHINE WORK

MIDDY BLOUSE

The middy blouse is a most satisfactory garment for girls, especially for school wear. In appearance, it is becoming and attractive. Since it allows freedom of movement and permits the use of strong, durable material, it is a most suitable garment to wear during many kinds of physical exercise.

Pattern.— A very simple model (fig. 59) successfully made will be much more satisfactory than an elaborate one not so well made; therefore the selection of a pattern should receive very careful attention. If you have done a great deal of sewing, you may safely undertake pleats or smocking perhaps; otherwise do not risk it.

Materials.— Indianhead, duck, poplin, percale, unbleached muslin, and galatea are some of the most desirable materials for a middy blouse. Buy the amount of material called for on the pattern envelop.

Colors.— An all-white middy is perhaps best; however colored collars and cuffs are often satisfactory. Any colored material should be tested for laundering, since it is difficult to find even reds or blues that will not run into the white. A red or a blue lace or tie is attractive with a white middy.

Shrinkage.— A middy is not intended to fit closely. Therefore it is not necessary to shrink the material. It should be made sufficiently loose in the beginning to allow for shrinkage.

To cut the middy blouse.— Read carefully the directions on the pattern envelop. Consult the chart, if there is one, for placing the pattern on the cloth. Place large pieces first, but place all pieces before beginning to cut the material. If possible ask some experienced person to look over your work at this point.

To make the middy blouse.— Since the middy blouse is more difficult to make than the garments thus far discussed, more complete directions are given.

1. Front facing. If you need to use a facing in which to work eyelets on the front of the middy, follow the directions on the pattern very closely. This facing should be stitched in place before the underarm seams are made.

2. Basting. Match the notches, and baste the shoulder and underarm seams about one-half inch from the edge on the right side.

3. Fitting. Try on the blouse and make alterations in the seams if necessary. Alterations are not likely to be necessary, however.

4. Shoulder seams. Finish the shoulder seams with a flat fell turned toward the front.

To make a flat fell, stitch the seam one-half inch wide or a little wider, trim the front edge of the seam to about one-eighth inch, crease a narrow

turn on the back edge, and crease the seam flat. Baste the seam, and stitch it very near the edge. Remove the underarm basting, and leave this seam open until the collar is attached.

5. Collar. The collar that goes with the type of front facing described is easily adjusted if the directions on the pattern are followed exactly. If no facing is used, cut the neck low enough to slip over the head without a placket, and make a sailor collar to come to the point in front.

To make a sailor collar, cut one layer of cloth by the pattern, baste or pin this piece to another layer of cloth, and cut a second layer by it. Stitch a seam around the outside edges, remove bastings or pins, turn the collar inside out, and crease the seam edge carefully. Pin the collar in several places to hold the two layers together and exactly even, especially at the neck edge.

6. Joining the collar to the blouse. Pin the center back of the collar to the right side of the blouse. Fit the collar to the neck edge, and pin it in place, keeping the two layers of the collar together. Baste it with short, firm stitches. To finish this seam, use a bias strip of cloth or a bias tape sufficiently long to reach around the neck edge. Baste this strip to the neck edge on the top of the collar. Stitch a seam as narrow as possible to catch all the layers of cloth firmly. Trim the seam if necessary. Make a narrow turn on the inside edge of the strip. Crease the seam so that the strip lies flat on the inside of the neck edge. Baste it in position. Finish the ends at the point in front neatly with hand stitches. Stitch the strip very near the edge.

7. Finishing the sleeves at the bottom. A plain facing may be put on the right side of a short sleeve as follows: Cut a strip of cloth two and one-half to three inches wide and long enough to fit the bottom of the sleeve. Pin it flat to the wrong side of the sleeve with the edges even. Make a plain seam at the bottom. Turn the facing to the right side, crease it well, and pin it in place. Stitch it very near the upper edge.

A straight cuff may be used on either a long or a short sleeve. The lower edge of a short sleeve may be left plain, but the lower edge of a long sleeve must be gathered or pleated to hand size, before the cuff is put on. To make this cuff, cut a straight strip lengthwise or crosswise of the cloth from five to seven inches wide and long enough to extend around the lower edge of the short sleeve or to slip over the hand easily for a long sleeve. Pin the cuff to the lower edge of the sleeve, holding the right side of the cuff to the wrong side of the sleeve. If there is fullness in the sleeve, a gathering thread may be used to draw up the edge to the cuff size or the fullness may be laid in several small pleats. Stitch a seam about one-fourth inch wide.

The sleeve may be finished with a hem. For a long sleeve, the pleats may be put in after the hem to form a cuff effect. Explanations will be found on the pattern envelop.

8. Setting in the sleeves. Match the notches, and baste the sleeve to the blouse with the wrong sides together. Make a flat fell on the right side according to the directions given for the shoulder seam (p. 63). Turn the seam toward the sleeve. Cut the sleeve edge to make it narrower than the waist edge, crease the waist edge to cover it, and stitch it to the sleeve.

9. Making the underarm and sleeve seams. Use a french seam or a flat fell turned toward the front for the underarm and sleeve seams. Match the edges exactly at the bottom of the cuff.

10. Hemming the blouse. At the bottom of the blouse make a hem of the width allowed in the pattern.

11. Pockets. Crease, baste, and stitch a hem at the top of the pockets. Turn under the remaining edges, and baste them. Place the pockets according to markings on the pattern, and baste them in place. Stitch them near the edge.

12. Eyelets. Eyelets are very easily made and are satisfactory for the front closing.

FIG. 59. A PLAIN BUT ATTRACTIVE MIDDY BLOUSE
It is made of poplin and is all white except for a scarlet lace

Measure the spaces carefully and punch three or four eyelets on each side of the front opening. Use a punch that will not cut the threads but will merely push them apart. Make holes large enough to carry the lace or the cord easily. Bring the needle thru from the wrong to the right side a few threads back from the edge of the hole, leaving an end of the thread about an inch long. Hold this end firmly until you have made several stitches. Take close overhanding stitches from right to left, drawing them tight to make a firm edge. Fasten the thread by taking two or three small stitches on the wrong side thru just one layer of cloth.

WAIST

Making a waist should be a fairly simple problem after experience with a middy blouse. A waist may be similar to a middy blouse in

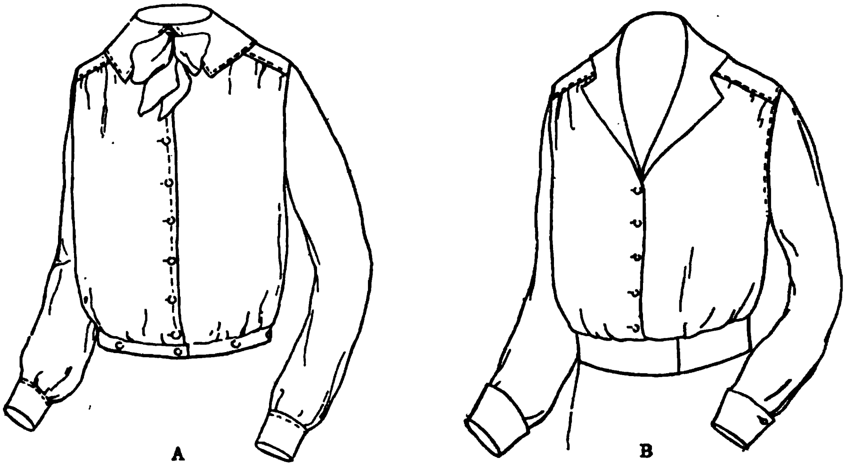

FIG. 60. GOOD DESIGNS FOR WAISTS

A, girl's long-waisted blouse to be worn with a jumper dress or a separate skirt; B, girl's plain shirt waist

many respects, depending somewhat on the kind of material used and the pattern selected. If you have not had much experience, follow closely the suggestions concerning the pattern and the material.

Pattern.—Choose a very simple pattern. It is important to have the bust measure correct in order that very little alteration may be necessary.

Material.— Select a firm material of medium weight, such as flaxon, batiste, linene, or percale. It is very difficult to get good results with such materials as voile and crêpe.

Trimming.— The kind and amount of trimming necessary depends on the kind of material and the pattern used. Very little trimming should be used if this is the first waist you have made.

To cut the waist.— Follow the directions on the pattern envelop very carefully; these fit the particular waist and are better than any general directions that might be given here. Notice all notches and markings of any kind.

To make the waist.— Directions for making the waist are as follows:

1. Basting and fitting. Baste the underarm and the shoulder seams, making them the width allowed in the pattern. If french seams are to be used, baste the seams on the right side. Baste the front hems. Try the waist on. Do not make changes unless you are very sure that you can

FIG. 61. ALLEGANY COUNTY PROJECT WORKERS WEARING GARMENTS THAT THEY HAVE MADE

improve the fitting. Waists are so loosely fitted in these days that an inexperienced person should depend largely on the pattern.

2. Underarm and shoulder seams. Either french or plain seams may be used under the arms and on the shoulders. French seams are neater than plain ones on the lightweight materials. If plain seams are used, they should be finished by turning in the edges and overhanding or stitching them together.

3. Collar. Make and attach the collar in the same way as for the middy blouse.

4. Finish at the bottom. The waist may be finished at the bottom in several ways. An elastic run in a hem is convenient, but it needs replacing often unless it is removed each time before the waist is laundered. A drawstring may be used instead of an elastic in the hem. A band may be stitched across the back at the waist line, after the waist is drawn to the right size by two rows of gathering. This band may be long enough to bring across the front and thus hold the gathers in place, or it may have

tapes attached at each end at the underarm seams for this purpose. Another method of holding in the fullness is to stitch a strip about an inch wide across the back of the waist line, leaving the ends open for an elastic to be run thru. This elastic may be removed before the waist is laundered, and it may be used for more than one waist.

5. Sleeves. French seams may be used on the sleeves. Run gathering threads about one-fourth inch apart between the notches at the top of the sleeves. Even tho there may seem to be very little fullness, it is best to run in these threads.

If the sleeves are short, the cuffs may be attached before the sleeves are sewed in; if long, they should be attached after the sleeves are sewed into the waist.

Baste the sleeves into the armholes with notches matching and with the seam on the right side. Try on the waist, and see whether the fullness is properly placed. The only alteration should be in the distribution of the fullness. If there are stripes in the material, they should lie in a straight line from the elbow to the top of the shoulder. Finish the armholes with french seams.

6. Cuffs. Cuffs may be made just as for the middy blouse. For long sleeves it is best to fit the cuffs on the sleeves after the sleeves are in the waist and when the waist is on the person. Gather the sleeves at the bottom before the waist is tried on. While it is on the figure, slip one cuff on, and pin it in place to make the length right. Generally the seam of the cuff should meet the seam in the sleeve; sometimes it should be placed farther under the arm. With about four pins mark the line where the cuff joins the waist. Distribute the gathers to look right, and so that the sleeve fits comfortably over the elbow. Remove the waist, and unpin the cuff from the sleeve, leaving the pins that mark the line where the cuff joined the sleeve. An allowance should be made for a seam and about one-half inch for shrinkage, if the sleeve was fitted at just the right length; therefore cut the sleeve off about one and one-fourth inches below the line of pins.

To make the second sleeve like the first, pin the piece that you cut from the first sleeve to the edge of the second, using it as a pattern to cut off the second sleeve. Gather the sleeve at the bottom, and baste the cuff to it. A french seam may be used if the cuff is only one layer of cloth and of lightweight material, or a plain seam may be made on the wrong side and bound. In a double cuff the two layers of cloth may be separated to allow it to be put on as a band.

SKIRT

A skirt that can be worn with a middy is recommended as the best garment to choose for making after the middy has been completed. A

skirt for this purpose may be plain gored, or it may be straight gathered or pleated. Either of these is fairly simple in construction. More important considerations are the amount of material required and the laundering. The plain gored skirt has of course marked advantages in these respects.

Pattern.— Any very simple pattern may be chosen from a pattern book.

Materials.— Any wash material that is firm and fairly heavy, and that will not fade, is suitable. Some of the best materials for this purpose are linene, indianhead, poplin, galatea, union cloth, and such special skirt materials in figures and stripes as come into the market each season.

Trimming.— A plain white skirt may have stitching or buttons for trimming. A striped or figured material needs no trimming.

FIG. 62. LEWIS COUNTY CLOTHING PROJECT WORKERS
They completed the work of Class C, and are wearing the dresses that they made

Shrinkage.— It is desirable to have the material for a plain skirt shrunk before it is cut. If it is not convenient to shrink it, fit the skirt loosely. Always make a hem deep enough to allow for letting down.

To cut the skirt.— Read the directions on the pattern envelop, and study the chart carefully. Place the pattern on the material as indicated. If the material has a right and a wrong side or an up and down in the design, do not forget to consider it. Perhaps you should have some experienced person look over your work after the pattern is placed and before any cutting is done. If there are marks for pleats or pockets, indicate them on the cloth with a tracing wheel or pins or bastings. If pins are used, they should be put thru the cloth more than once so that they will not fall out before they have served their purpose.

To make the skirt.— Suggestions for the various processes in making a skirt are as follows:

1. Basting. Pin the gores of the skirt together, matching the notches. French seams may be used if the material is light in weight. In this case,

pin the seams on the right side of the skirt. If plain seams are used, pin the seams on the wrong side. In either case, baste all the seams, beginning at the top and using small even basting stitches down to the hip line and longer uneven basting stitches below that point. The seams should be basted the width allowed on the pattern.

2. Inside belt. Make an inside belt to fit the figure exactly. Sew the hooks and eyes on firmly. Use commercial belting of good quality if possible; otherwise shrink a piece of firm material, and stitch together crisscross four layers folded to the proper width, one and one-half to three inches. Try on the belt, allowing the fastening to come wherever the skirt placket is to be.

3. Fitting. Try on the skirt. Pin the skirt to the belt at the seams and at a point or two between the seams, allowing the skirt to extend above the belting about one-half inch. The seam lines should hang straight from the waist to the bottom. There should be slight fullness in the skirt at the waist line to be worked in later. Make any alterations in the seams that may be necessary, pinning outside the basted line if the skirt is too large. Two girls should help each other, or some experienced person should be asked for help, since it is exceedingly difficult for a girl to fit herself.

Rebaste the seams if alterations have been made. Slip the skirt on again to make sure that the seams are right. Stitch the seams just outside the basting if the skirt is right as it is basted. The seams may be either french or plain. Edges of plain seams should be overcast or turned in and overhanded together.

4. Placket. Make a placket, following the directions on the pattern envelop or as follows: Cut two strips one and one-half inches wide and about one inch longer than the placket opening. On the right side sew one of these strips to each side of the placket opening. The placket when finished should lap from right to left on the person; therefore be sure which is the right edge, turn the strip on this edge all the way underneath and crease it well on the seam edge. The free edge may be creased and hemmed down to the skirt, or it may be finished with a narrow hem and left free. If it is left free, hold the strip in place by sewing the snaps on it and catching a short stitch thru the outside layer occasionally.

To finish the left side, which is underneath, crease the strip as tho it were a band, and stitch the edge so that it comes just to the first seam. Fasten the placket with snaps or hooks and eyes.

5. Putting the skirt on the belt. Baste a one-half-inch turn to the wrong side around the top edge of the skirt. Run a gathering thread near the double edge. Try on the belt and the skirt. Pin the skirt to the belt at the placket, at the center back, and at all seams, and place

extra pins until they are about an inch apart all around. Distribute the fullness. Make sure that all folds hang straight from top to bottom. If there are diagonal folds or wrinkles, try lifting the skirt and pinning it above the edge of the belt at the back or the front until this is remedied.

Remove the skirt and baste it to the belt. Remove the pins, and stitch the skirt to the upper edge of the inside belt.

6. Hemming. Put on the skirt, and have some one mark an even length from the floor by a row of pins, using a ruler for measuring (fig. 55). Find the narrowest part of the hem by measuring from this line of pins, and cut off the lower edge to make the hem even. Crease a one-half-inch turn on the bottom edge and another at the row of pins. Baste the hem down, holding in any fullness by means of small pleats. Stitch the hem near the edge. If the stitch on the machine is lengthened for stitching the hem, it may be ripped easily later when the length needs to be changed.

FIG. 63. A GOOD MODEL FOR A HOUSE DRESS

DRESS

The directions needed for the processes in making a dress are the same as those for the middy blouse, the waist, and the skirt. The simple model shown in figure 63 is good for a house dress.

To make the dress.— When a student is ready to make a dress, she has probably had enough experience to decide for herself such points as the following:

What seams should be made first?

How much basting is necessary, and how should it be done?

How much fitting is necessary?

What kind of seams will serve the various purposes best?

At what points, if any, would handwork be better than machine work?

How important is it that all ends of threads be fastened in one way or another?

Does it pay in the end to do a thing the best way or to make a doubtful short cut?

If you had the best teacher in the country, she would not continually decide such points for you and keep watch to see that you made no

mistakes. Rather, she would try to lead you to have pleasure from good results, to decide for yourself, as soon as your experience would permit, what is the best way to do certain things and to want to do them in that way. She would put the responsibility on you in such a way that you would blame only yourself when things went wrong, and on the other hand would get much pleasure from success because the credit would be yours. Therefore it is right that you should make many decisions for yourself in this work.

If at any time you failed to heed advice offered to you by persons more experienced than yourself, you have probably paid the penalty in extra work or less satisfactory results than you might have expected, for it has long ago been proved that the wisest person profits by the experience of others as well as by his own.

It is not expected that you will permit any one to do for you what you can do yourself. Whatever help you accept should be in the form of instruction by which you are made able to do the thing yourself next time.

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REARING THE DAIRY CALF

A MANUAL FOR JUNIOR EXTENSION WORKERS IN CALF REARING

NEW YORK STATE COLLEGE OF AGRICULTURE, UNITED STATES DEPARTMENT OF AGRICULTURE, NEW YORK STATE DEPARTMENT OF EDUCATION, COOPERATING

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REARING THE DAIRY CALF

HOWARD B. ALLEN[1]

Rearing a dairy calf is a business undertaking that requires serious thought and careful planning. In the first place, find out all you can about calves, and about the particular kind of calf that you expect to have. Discuss your project with your parents, your teachers, and your

FIG. 64. A GOOD CALF AND A GOOD PROJECT

project leader. During the progress of the work consult them frequently, especially as new problems arise, and adapt your methods to the calf's development, always following the best advice that you can get.

HOW AND WHEN TO BEGIN

Your actual start will depend on how and when you get your calf. Perhaps you may receive the calf as a gift, you may obtain him thru a calf club, or you may buy him outright. Under any circumstances obtain the best calf that may be had.

[1]The writer acknowledges his indebtedness to Professor E. S. Savage, of the Department of Animal Husbandry, to Professor W. F. Lusk, of the Department of Rural Education, and to Professor K. C. Livermore, of the Department of Farm Management, for suggestions and criticisms in the preparation of this manual.

If you buy from a breeder of dairy cattle, select your calf for the superior performance of his parents, as well as for his own characteristics. By joining a club you may be able to obtain a better calf than is available from the home herd or from a neighbor's herd. Many purebred calves are distributed by bankers and livestock breeders to boys and girls who are enrolled in calf clubs.

However, there are many advantages in the home-bred calf, especially if you are able to select the best cow in the herd as his mother. The

FIG. 65. AN IDEAL CALF

parentage of the calf is important, as it foretells to a large extent how a calf will develop. Furthermore, you can help to make certain of a vigorous calf by taking good care of his mother before the calf is born.

Give the cow plenty of good hay, and silage, roots, or green feed, together with enough grain to keep her in good flesh. A few days before the calf is to be born, put the cow in a roomy, clean, box stall with fresh bedding. Change her grain ration at this time so that it is composed chiefly of wheat bran. The calf from a properly nourished cow will be strong and well-developed when born.

You can see from what has already been stated that the time to begin a ca'f-rearing project depends far more upon the calf than upon the season

of the year. Whether your calf is born in spring or fall does not matter nearly so much as whether he is the best calf you can get. With the consent of your parents that you may undertake the rearing of a calf, and with the promise of their help when you need it, you may start your project at any season that a good calf is available.

CARE OF THE NEWBORN CALF

If the birth of the calf has been normal, he should be left with his mother for two or three days. Immediately after the calf is born, his navel cord should be painted with iodine to guard against infection which may result in disease. The cow will probably lick her calf clean and dry; if she does not, rub him dry yourself. Be sure that the calf suckles his mother within a few hours after birth. This is important, because the first milk secreted by the cow, called colostrum, acts on the calf as a laxative and cleans out his digestive tract. If the calf is weak, help him to reach the teats of the mother cow.

THE IDEAL CALF

The calf that you select should be healthy, heavy, and strong. If his birth has been normal, he will stand up solidly and squarely soon after birth. A good calf has the following characteristics:

Straight back
Belly held up snugly
Broad chest
Straight legs
Medium-sized ears
Alert but not nervous eyes
Soft, loose hide
Silky hair
Active but not restless disposition
Proper color for the breed

THE CALF PEN

Allow the calf freedom in a well-lighted, warm, separate pen at least four by six feet in size, until he is a month or more old or is ready to go on pasture. To the wall of the pen, nail and brace firmly a feed box at such height that the calf can reach into it without straining. Also equip the pen with a slat hayrack so hung that the calf can reach the hay but cannot throw it out of the rack.

TEACHING THE CALF TO DRINK

When the calf is two or three days old, separate him from his mother and teach him to drink from a pail in the following way. Put two quarts of fresh, warm milk in a pail. Dip two of your fingers in the milk, and, while the calf is sucking them, gradually move your hand down into the pail until the calf's mouth is in the milk. Hold your fingers slightly apart so that the calf can draw in milk between them. As soon as the calf gets a good taste of the milk, gradually withdraw your fingers. With a few attempts, the calf will learn to drink from the pail.

FIG. 66. TEACHING THE CALF TO DRINK FROM A PAIL

RULES FOR FEEDING A CALF

For the first three weeks after birth, feed your calf, three times a day, equal portions of sweet whole milk at body temperature (between 90° and 100° F.). The temperature of the milk should be just right; if necessary, test it with a dairy thermometer.

The amount of milk to feed depends on the weight of the calf. If your calf weighs 50 pounds, feed him 3 pints of milk in the morning, 3 pints at noon, and 3 at night; if he weighs 75 pounds, feed him 3½ pints each time; if he weighs 100 pounds, feed him 4 pints each time. As your calf grows and demands more food, gradually increase the amount of milk.

Keep the pail from which you feed your calf so clean that you would be willing to drink milk from it yourself.

When your calf is three weeks old, gradually substitute skimmilk for the whole milk. The first day at each feeding substitute $\frac{1}{3}$ pint of skimmilk for the same quantity of whole milk, that is, a total of 1 pint during the whole day. The second day, substitute a total of 1 quart; the third day, a total of 3 pints, or one pint at each meal; and so increase the total substitution by a pint each day until you are feeding your calf skimmilk entirely. Feed only sweet skimmilk, and at body temperature as in the case of whole milk. However, if your calf is not thrifty, continue to feed him whole milk until he is in good condition.

Supply your calf with all the good clover or alfalfa hay that he will eat. Give him fresh water every day, or let him have access to clean water at all times.

While calves are being fed on whole milk or skimmilk, they need very little salt, but it is a good practice to feed them a small handful of salt once a week.

When your calf is about three weeks old, feed him all the dry grain mixture that he will lick up clean after drinking his milk. Put the grain mixture in the feed box, not in the skimmilk, nor in the pail from which the milk was fed. The following grain mixture, which you can prepare yourself, is recommended:

30 pounds wheat bran 30 pounds ground oats 30 pounds cornmeal 10 pounds linseed oilmeal	or	90 pounds ground oats 10 pounds linseed oilmeal

When the calf is four or five months old, two pounds of dry grain fed twice daily should be a sufficient grain ration.

PRECAUTIONS IN FEEDING

Sudden changes in feed are likely to make the calf sick; therefore, take at least ten days to change the calf's ration from whole milk to skimmilk and grain. A calf upset by a sudden change of diet or by overfeeding may be stunted or may lose several weeks' growth.

Creamery skimmilk should be pasteurized or boiled for half an hour in a double boiler. Serious diseases may result from feeding raw creamery milk. Take no chances with your calf.

SKIMMILK SUBSTITUTES

If you cannot obtain skimmilk to feed your calf after he is three weeks old, warm gruel is the best substitute. Mix equal weights of soluble blood flour, hominy feed, red-dog flour, and lindseed oilmeal. Into a pound of this dry mixture stir enough cold water to make a paste, to

which add enough water at a temperature of 145° F. to make a gallon of gruel. Test the temperature of the water with a dairy thermometer, for if the gruel becomes hotter than 145° it will be injured. A dairy thermometer can be bought for less than a dollar, and would soon save its cost in gruel. Feed the gruel warm to the calf as you would skimmilk.

In changing from whole milk to the gruel substitute, it is not wise to change as fast as one would change to skimmilk. You should take at least two weeks to make the change. The best practice in order to raise a good calf is to continue feeding some milk until the calf is five months old. Do this by putting one pint of whole milk into each feeding of gruel.

PREVENTING THE GROWTH OF HORNS

When the calf is about ten days old you can first feel a button-like lump where each horn would later appear. This is the best time to prevent the growth of horns (fig. 67), but do not attempt the operation until you have had instructions from an older person. Ask your father or some other man to help you hold the calf. With scissors clip the hair from the button-like lump. Wrap the end of a stick of caustic potash or caustic soda in paper, to protect your hands; dip the end of the stick in water, and, holding it as you would a pencil, rub the skin over the lump until it bleeds at the center. Rub vigorously, especially on the highest part of the lump and for a space around it about the size of a dime. Be very careful not to let the caustic liquid run down into the eyes of the calf.

Perhaps your teacher or the farm bureau agent will demonstrate this operation on your calf if you get everything ready.

WHERE TO KEEP THE CALF IN SUMMER

Your calf must have clean, airy, light, and dry barn quarters and a yard with shade. Bring your calf into the barn during the heat of the day so that flies cannot bother him, and take him out to pasture in the late afternoon. Keep your calf where there is no possibility of his licking up paint or similar poisons. In case there are several calves together, build some calf stanchions so that the calves cannot interfere with each other while feeding.

SCOURS AND RINGWORM

Diarrhea may be a first indication of scours. If diarrhea starts, immediately cut in half the amount of the ration and sterilize all pails and feed boxes with scalding water. If no other remedy is at hand, feed the calf three times a day a cupful of smooth creamy liquid made of clean clay and water. This is a first-aid remedy only, and a veterinarian

Fig. 67. PREVENTING THE GROWTH OF HORNS

First step, hold the calf securely; second step, trim away the hair over the button-like lump; third step, rub the skin with a dampened stick of caustic potash

should be called if the trouble continues. All cases of scours should be reported promptly to your leader. Scours may result from overfeeding or from using dirty pails, and is a disease more easily prevented than cured. A serious case may cause the death of the calf or may injure him for life.

Ringworm is a disease resulting from dirty surroundings and appears on the calf as a bare rough spot around the eyes or on the face or the body. Ringworm may be controlled by bathing the affected spot with a solution of one part sheep-dip or coal-tar disinfectant in twenty parts of water. Be careful not to get the solution in the calf's eyes. A salve made of

FIG. 68. A CALF AT WEANING AGE

lard and all the sulfur that you can work into it, will also cure ringworm if properly rubbed into the skin.

Lice on the calf's body are easily killed by bathing him with the disinfectant solution of one part disinfectant in twenty parts of water. In bathing the calf during cold weather, be sure to blanket him until he is dry.

Keep your calf in clean surroundings and well brushed at all times, as a preventive measure against disease. Study your calf daily, and in case of any ailment consult your father, your leader, and your teacher.

CARE OF THE CALF FROM SIX TO TWELVE MONTHS OF AGE

You will stop feeding your calf milk when he is about six months old. If he is eating well of other feeds and gets a variety including silage, roots, or other succulent food, he will not notice the change from milk

to other feed. Of course, when the milk is dropped out of the ration the other feed will be increased. If your calf is a bull, separate him from the other stock on the farm at this age, if this has not already been done.

After your calf is six months old, his care will require less of your time but is just as important. If your calf reaches this age in the spring, he should make steady gain if given good pasturage and grain thruout the summer. If pasturage becomes short, feed your calf additional green stuff if possible. The grain mixture given on page 79 is also recommended for the calf during this period, and should be fed at the rate

FIG. 69. AFTER SIX MONTHS OF SERIOUS WORK

of one pound per day for the first hundred pounds of the animal's weight, and one-half pound more for each additional hundred pounds. That is, if your calf weighs 350 pounds, you should feed him 2¼ pounds of grain mixture each day.

If your calf is six months old in the fall, feed him a ration of all the hay he will eat and grain in proportion to his weight as already explained. Your calf will grow more rapidly if you can add silage or roots to this ration during the winter. If you have no silage on your farm, as a companion project to your calf-rearing you might raise a root crop to supply succulent food for your calf. See that your calf has plenty of fresh water and is given a handful of salt at least twice a week.

THE YEARLING

If your calf is a year old in the fall and is a heifer, place her with the dry cattle on the farm. Whether she is put in a stanchion or not, she should have the same attention as is given the milking stock. Feed her regularly on hay, silage, and grain, the last in proportion to her weight as explained, and give her plenty of water and salt regularly. If you must feed her cornstalks, they may be improved by cutting in pieces and soaking with warm water before they are fed.

Turn your heifer calf on pasture for the summer, if she becomes a yearling in the spring, and feed her a grain ration that will insure her full development into a good-sized dairy cow. Supply her with salt and plenty of fresh water.

BREEDING THE HEIFER

Size rather than age should determine when to breed a heifer, but if well grown she should be ready for breeding when from fifteen to eighteen months old. Ask advice as to the best plan to follow with your heifer when that time approaches.

Breed your heifer to a purebred bull. Only such a bull will secure the advantage of her development in a good calf, which in that case will possess good points from both parents. A scrub or grade bull may offset many of the good points of the heifer and transmit poor points to the calf.

LATER CARE OF THE HEIFER

The period after your heifer has been bred is the most important of her life. She must be cared for, fed, and sheltered better than ever. She now requires food for three purposes. She must continue her own growth, she must nourish an unborn calf, and she must store reserve material to be converted into milk after the calf is born. Therefore, to feed your heifer too little would be to cheat yourself, for it would make her a poor cow, bring a poor calf, and cut down her flow of milk when she freshens. Feed her a full ration of hay, silage, and grain in proportion to her weight, which will keep her growing and in good flesh. Then both mother and calf will be well nourished.

When your father warns you that the calf may be expected soon, change the heifer's grain ration so that it is composed chiefly of wheat bran, a laxative diet that she needs at this time. Confine her in a clean, roomy box stall, and keep her brushed clean. When the calf is born, give him the care suggested on page 77. Your heifer should not be milked out clean immediately after the birth of the calf. For the next few days give her only a light ration, for she now uses some of the reserve material that she stored up during previous months. Gradually increase the

quantity of feed, until in about a week you are giving her a full milking ration. If you have learned to compute rations, you will know that the food requirement is based on the yield of milk.

COW-TESTING PROJECT

By carrying on a cow-testing project with your heifer you can prove the results of your careful rearing. Or you may wish to start another

FIG. 70. GETTING READY FOR THE EXHIBIT

calf-rearing project with the calf from your heifer. You might even carry on both these projects and so establish a more complete record.

THE EXHIBIT

Bring your stock to the exhibit. You and the other boys and girls who have completed the calf-rearing project will be benefited by showing each other what you have done. School and county fairs are the best places to hold such exhibits.

During the weeks just before the exhibit give your calf additional care so that it will look its best. Grooming it carefully every day and adding a little oilmeal to the ration will make the coat soft and glossy. Wash the legs and wipe off soiled spots a few days before the exhibit, but do

not give your calf a general bath, for it might remove the oil and gloss from the coat and in some seasons endanger the animal's health. Do not decorate your calf with ribbons; a well-fed, well-groomed animal looks better without such adornment.

FIG. 71. A COUNTY CALF CLUB EXHIBIT

REVIEW QUESTIONS

1. Why is it patriotic to rear a good calf?
2. In what ways may dairy herds be improved?
3. Describe the ways in which workers can obtain calves.
4. How much should your calf be worth as a yearling?
5. In what ways could you get back the money invested during the growth of a yearling?
6. Is there a rule as to what month to begin rearing a calf? Why?
7. Why is a calf from a good cow more valuable than one from a less productive cow?
8. Do you look like your father, or your mother, or both? Do calves look like their parents? Do they resemble them in any other way than in appearance?
9. Why should a newborn calf be rubbed dry at once if the mother does not lick it dry? For what other purpose besides drying it, does the cow lick the calf?
10. What objection is there to tying calves behind the cows near the manure gutter?
11. Why will a calf suck your fingers? Why should you leave a space between your fingers when teaching the calf to drink?
12. Why do you feed your calf warm milk? Why not feed your calf all the milk it will drink? How often would a calf feed if it ran loose with its mother?

13. Why do you feed a calf amounts of milk according to its weight?
14. What will you do if your calf appears to be sick?
15. Describe the hay that you will feed your calf.
16. Why do you replace whole milk with either skimmilk or gruel in your calf's diet?
17. Why is it undesirable to feed grain in the milk pail or mixed with milk?
18. What is the difference in composition between skimmilk and whole milk?
19. Why is it necessary to feed either gruel or skimmilk after the whole milk is discontinued?
20. Why is it necessary to feed gruel warm?
21. How would you treat skimmilk from a creamery? Why?
22. When are horns on cattle a nuisance and when are they desirable?
23. Why is it necessary to wrap paper about a stick of caustic? Why should you avoid getting caustic into the calf's eyes?
24. How can you prevent flies from bothering your calf?
25. How may disease in calves be most easily prevented?
26. Why are boys hungrier when they are growing fast? How are calves like growing boys?
27. How can a cow give more nourishment in her milk than she receives in the food she is eating?
28. At what time of year is silage usually fed? Why? Why does your calf like roots and silage?
29. How long does it take you to get back your appetite after being ill in bed? How long after the calf is born should you wait before giving a cow her full ration?
30. In what two ways do you test the production of cows?
31. When and why do you wear your best clothes? How can your calf wear his " best clothes "? When should he?
32. What advantages are there in exhibiting your stock at the fair?
33. Why do you keep records? What do they tell you?
34. If somebody borrowed money from you every day, how would you keep track of it? How are you to keep track of what you lend your calf?

REFERENCES

The first part of this manual has given you general rules and suggestions on rearing a calf; books and bulletins will give you more detailed information. Most school libraries now contain books on agriculture, but if your school has none, perhaps you can borrow from another school or from a public library. Your teacher or any other junior extension leader will be glad to help you.

The following books contain information valuable to those who rear calves:

Dairy farming. C. H. Eckles and G. F. Warren. The Macmillan Company, New York City

Dairy cattle and milk production. C. H. Eckles. The Macmillan Company, New York City

Productive dairying. R. M. Washburn. J. B. Lippincott Company, Philadelphia, Pennsylvania

Manual of farm animals. M. W. Harper. The Macmillan Company, New York City

Feeds and feeding (abridged). W. A. Henry and F. B. Morrison. Henry-Morrison Company, Madison, Wisconsin

Agricultural bulletins published by the New York State College of Agriculture, the New York State Department of Agriculture, the New York State Experiment Station, and the United States Department of Agriculture, contain just as reliable and, in some cases, more recent information than the textbooks. Most of these bulletins will be sent free of charge to project workers, and by addressing an inquiry to the State Leader of Junior Extension, State College of Agriculture, Ithaca, New York, you can find out what bulletins on calf rearing are available to you.

NOTEBOOK

A project notebook is a written record telling what you have learned and done in your project. The record book supplied with this manual asks you for answers to many questions that may be explained fully in the notebook. Facts learned from your work or from reading of magazines or bulletins should certainly be told. Record any new ideas as soon as you have learned them, so that you will be able to make a final report. You can make a neater notebook by copying these first notes at the close of the project. Do not leave the notebook until the last week and expect to remember everything at one time.

GENERAL REQUIREMENTS AND DIRECTIONS FOR THE JUNIOR HOME PROJECT IN CALF REARING

AGE REQUIREMENTS

Any girl or boy living in New York State may undertake a calf-rearing project by meeting the following conditions:

a. You must be under twenty years of age.

b. You must obtain your parents' or your guardian's consent.

c. You must have the facilities at your command necessary for doing the work properly.

You should enroll for that division, or class, of the work that is designed for boys and girls of your age. If you desire to do the work of an older group or class, first obtain your leader's or your teacher's consent.

The divisions of the project are:

	CLASS A	CLASS B	CLASS C
Age..........	Up to 11 years inclusive	12 to 15 years inclusive	16 to 19 years inclusive

MINIMUM REQUIREMENTS OF WORK

Class A requires the feeding and management of a grade or purebred heifer calf or a purebred bull calf for a period of at least six months. The calf should be not more than six months of age when you begin your project.

Class B requires the feeding and management of a grade or purebred heifer calf or a purebred bull calf for a period of ten to twelve months. The calf should be not over six months of age when your project is started.

Class C requires the breeding and management of a purebred heifer and the care of her and her calf for a period of twelve months. The heifer should be from twelve to fourteen months old when the project is started, and she should be bred so as to freshen before the project ends, but preferably not before she is two years old.

PURCHASE OF ANIMALS

Some boys and girls may hesitate to take up a calf-rearing project because they have no stock or perhaps cannot obtain purebred calves. This should not discourage any one, for bankers all over the State are helping project workers by advancing the money needed to buy calves or by supplying the calves. This is called the promissory note, or deferred payment, plan, and your teacher or your leader will explain it to you if you inquire.

ENROLLMENT

Enroll with your teacher, your county or local leader, or your superintendent of schools, who will send your name to the State Leader of Junior Extension at the New York State College of Agriculture, Ithaca, New York.

RECORDS

Record keeping is one of the general and specific requirements. You will keep complete and accurate records of your project on the pages provided for that purpose in this manual. When your project is near completion a final summary report card will be sent to you, and you will fill this card out and give it to your teacher, your project leader, or your superintendent of schools, who will send it to the State Leader of Junior Extension. Every project worker will be expected to keep these cash and labor records, and to answer all questions in the report book as directed.

NOTEBOOK

A notebook is a very desirable form of record, and the instructions already given should be followed.

EXHIBIT

An exhibit of your project work will undoubtedly be called for at your school, town, or county fair. You will thus have opportunity to compete for a prize and also to help your school and community make a good showing. Be ready to respond to the call of your project leader.

AWARDS

All rewards for a junior home project in calf rearing will be based on the following method of scoring:

CLASS A

Best calf, breed considered	80
Best and most complete diary of work done	20
Possible score	100

CLASS B

Best calf, breed considered	20
Greatest average daily gain in weight	30
Lowest cost of production	30
Best-kept records	20
Possible score	100

CLASS C

Best cow and calf, breed considered: cow, 30; calf, 20	50
Ability in judging and placing cows in the show ring	25
Best-kept records	25
Possible score	100

The following score card is the standard by which each contesting calf will be judged and the "best calf" selected. It shows you how your calf will be compared with others entered in the contest.

Development for the age, as indicated by height, girth, and weight... 6

An animal should gain on the average a pound a day for the first six months and 1½ pounds a day thereafter.

Development of the individual, dairy type 10

Head and neck 2

According to sex. Long muzzle; large mouth; open nostrils; quiet but alert eyes; well-set, medium-sized ears; broad, dished forehead.

Body 3
Freedom from pot-belly; broad chest; long, straight back; long, broad rump; wide-set pin bones.

Legs 2
Straight; heavy-boned but not coarse; set wide apart; upright pasterns; closed hoofs.

Dairy development 3
Sex characteristics strong; teats and udder evenly started; defined escutcheon; rudimentary teats and clean preputial tuft on male.

Condition 4
Every animal after six months of proper care and feeding should be in excellent condition. A sound fleshiness, not all fat, which hides the ribs, fills up the rump, and covers the pin bones, is desired. Well-groomed, soft, clean hide.

Total 20

This score gives the number of points to allow for "best calf" in Classes B and C. For Class A multiply this figure by 4.

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AT CORNELL UNIVERSITY, ITHACA, NEW YORK
A. R. MANN, DIRECTOR OF EXTENSION SERVICE

BULLETIN 3 SUPPLEMENT APRIL, 1919

REARING THE DAIRY CALF

CALF PROJECT RECORD BOOK

REPORT ON FEED, LABOR, OTHER COSTS, AND PRODUCT

Name........................Age...........Project
Class A B C
P. O. address.............................. (Cross out all but one)

County.....................Township...........................

School District No.......................Grade....................

Teacher...

District superintendent..

County leader..

Date project commenced.....................19 ....

Do you live on a farm?.......... ..How many acres in it?............

How many cows are kept on the farm?............................

NEW YORK STATE COLLEGE OF AGRICULTURE, UNITED STATES DEPARTMENT OF AGRICULTURE, NEW YORK STATE DEPARTMENT OF EDUCATION, COOPERATING

Published and distributed in furtherance of the purposes provided for in the Act of Congress of May 8, 1914

2019

SPECIAL REPORT ON STARTING THE CALF PROJECT

Answer these questions within one week after you start your project.

1. Is your calf a bull or a heifer? ....

2. Is your calf a grade or a purebred?..

3. What breed is your calf?..

4. How old is your calf?..

5. How much does it weigh (at the start)?.......................pounds

6. If you have started rearing more than one calf, give the name and value in dollars of each (A)..........................$.........

(B)...................$..........(C)..................$..........

(D)...................$.............

7. Was your calf given to you, bought by you, obtained by giving your note, or procured by some other plan? Tell just how you obtained it.

....

8. Where is your calf pen?..

9. Where will you keep your calf as it grows older?..................

....

10. How much pasture do you plan to allow your calf (or calves)........

....

11. What kinds of grasses grow in this pasture?........................

12. How many weeks will your calf stay on pasture?...............weeks

13. Will any cut green feed be necessary with this pasture?.............

14. What green feed will you be able to get for your calf? ....

....

15. Will you have to plant and grow this green feed as a crop? ....

....

16. What shelter will the calf have in the pasture? ....

....

SPECIAL REPORT DURING THE PROJECT

Answer these questions as soon as you know the answers from experience.

17. Until what age did your calf receive whole milk? ....weeks

18. At what age did your calf learn to drink from a pail? ....days

19. At what age did you wean your calf from milk? ....months

20. How many months was your calf on pasture? ....months

21. What extra green feed was supplied? ....

....

22. Did your calf have any disease? ....If so, what? ....

23. What did you do to prevent or cure any such trouble? ....

....

24. What have you decided to do with your calf (now that it is a yearling)?

....

25. How much did the gain in weight cost you per pound? ....

26. Name the feeds supplied the calf that you did not have to pay cash for...

....

....

27. Are you to continue with another project with this or another calf?

....

	WHOLE MILK OR SKIMMILK		GRAIN		HAY	
Fill in your report every Saturday. Enter the totals for each week under the proper heading. Put the date in this column.	Whether you pay cash for the milk or not, enter the amount fed and its value at the farm in the column below. Place a "W" before quart figures when for whole milk.		Whether you pay cash for the grain or not, enter the amount fed and its value at the farm. Give the names of these grains in the column under "Special notes" on the opposite page.		Enter the amount of hay fed the calf and its value at the farm. This will seldom be more than a cent a pound. Hay or straw for bedding should be reported under "All other costs" on the opposite page.	
	Quarts	Value	Pounds	Value	Pounds	Value
						$
TOTALS						

Carry these sums to the first line of each corresponding

SILAGE, ROOTS, OR GREEN FEED	LABOR, NOT PAID FOR IN CASH	SPECIAL NOTES	ALL OTHER COSTS
Whether you buy, grow, or receive free silage, roots, or green feed, report the amount fed and its value at the home farm for each week, on each Saturday.	In the left-hand column below, enter the total minutes you work each week; in the right-hand column below, enter the minutes of help received but not paid for in cash.	Weigh your calf or ask your father's estimate in pounds, and enter this figure in the proper space below. Name the grains fed during the month.	Enter the first value of the calf, cash paid for labor, and the other items listed below. Expenses for feed should not be entered in this column.

Pounds	Value	Yourself	Help	First weight of calf..............lbs.	Items	Amount
	$			Grain fed	First value of calf........$	
					Cash paid for labor.......	
				Weight of calf..........		
				Grain fed		
					Value of bedding used...	
				Weight of calf..........	Disinfectant..	
				Grain fed	Interest on a purchase note.......	
					Insurance on calf........	
				Weight of calf..........	Other expenses (name these)	
				Grain fed		
				Weight of calf..........		
				Grain fed		

column on the next two pages unless you are to carry
which case carry to pages 100 and 101.

2023

Put the date each week in this column.	WHOLE MILK OR SKIMMILK		GRAIN		HAY	
	Quarts	Value	Pounds	Value	Pounds	Value
		$		$		$
TOTALS						

Carry these sums to the first line of each

SILAGE, ROOTS, OR GREEN FEED			LABOR, NOT PAID FOR IN CASH		SPECIAL NOTES	ALL OTHER COSTS	
Pounds	Value		Yourself	Help			
	$					Total from other page......$......	
					Weight of calf..............	Other expenses (name these)	
					Grain fed		
					Weight of calf..............		
					Grain fed		
					Weight of calf..............		
					Grain fed		
					Weight of calf..............		
					Grain fed		
					Weight of calf..............		
					Grain fed		
					Weight of calf..............		
					Grain fed		

corresponding column on the next two pages.

Put the date each week in this column.	WHOLE MILK OR SKIMMILK		GRAIN		HAY	
	Quarts	Value	Pounds	Value	Pounds	Value
		$		$		$
TOTALS	............qts.		............lbs.		............lbs.	
	Milk..$	....	Grain..$	....	Hay..$	....

To compute the TOTAL FEED COST carry the three total values above to the column on the opposite page as directed by the long arrows.

In the space below compute the interest to be charged to your project. Add together the first and the final value of your calf. Divide this sum by two, and compute interest at six per cent on the quotient. Subtract from this amount any interest already paid on a purchase note, if there was one, and

You may use this space to compute the interest as explained above, using these further explanations.

First value of calf .... $..................

Final value of calf.................... $..................

Add these and divide by.......... 2

....

× .06

Interest on the average value........... $..................

Subtract any interest paid............. $..................

Interest to be charged................. $..................

2026

SILAGE, ROOTS, OR GREEN FEED		LABOR, NOT PAID FOR IN CASH		SPECIAL NOTES	ALL OTHER COSTS	
Pounds	Value	Yourself	Help			
	$				Total from other page. $	
				Weight of calf......	You have used buildings, land, pasture, horses, and the like. If you paid cash for these, enter the sum. If not, ask your father what a fair rent would be and enter that figure for each item.	
				Grain fed		
					Pasture.....$	
				Weight of calf......	Use of buildings..$	
				Grain fed	Use of horses.....$	
					..........$	
				Final weight of calf .... lbs		

........lbs. Silage, roots, and the like..$........ ....

Hay → $........ ....

Grain → $........ ....

Milk → $........ ....

TOTAL FEED COST..$........ ....

Your own labor: ....min. = ...hrs.

Help: ....min. = ...hrs. at $........per hr.

$ .... = Value of unpaid labor not including your own labor.

TOTAL OF OTHER COSTS........ ....

Carry this item across and enter it here $........ ....

Carry this TOTAL FEED COST across and enter here $........ ....

enter a charge for such interest among the expenses in this column ......$........ ....

RETURNS FROM YOUR PROJECT

TOTAL COSTS .... (Except your own labor)

1. Did you sell your calf?........If so, enter the price..
2. If not, state a value or price on your calf here..... $........

3. Was there any other return from your project, such as veal sold, skin or hide, prizes, and the like?........$........

4. Enter the farm value of the calf manure here ....$........

Add these items to obtain the total return.....$........

Subtract the total costs .... ← Carry the total costs from above and enter here at the left.

NET RETURN FROM THE PROJECT FOR YOUR LABOR......$........

Net return per hour for your labor.........$........

VISITORS' ROLL

Ask each person who inspects your project to write the date and his name and title in the space below. If this is impossible at the time, fill this in later yourself; for example, June 1, 1919, John Jones, County Leader.

DATE	NAME	TITLE

NOTE

This report book contains the general form for project accounting recommended by the New York State College of Agriculture and the New York State Department of Education. Proper certification of this report is sufficient evidence that the project has been completed satisfactorily.

This report book may also be used for contest work. In that case it should count for at least 20 of the possible 100 points given in the basis of awards.

When the project is completed, this report is to be properly certified (see below) and sent to your district superintendent of schools. Only the parent need certify to this record when the work is on a contest basis.

CERTIFICATION

I have visited or am familiar with this project and, to the best of my knowledge, the statements contained herein are correct.

Signed ....

(Parent)

....

(Teacher, County Leader, or Local Leader)

Examined and approved ....

(District Superintendent)

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A. R. MANN, DIRECTOR OF EXTENSION SERVICE

BULLETIN 4 JUNE, 1919

THE VEGETABLE GARDEN

A MANUAL FOR JUNIOR EXTENSION WORKERS IN VEGETABLE GARDENING

A PRIZE-WINNING GARDEN

NEW YORK STATE COLLEGE OF AGRICULTURE, UNITED STATES DEPARTMENT OF AGRICULTURE, NEW YORK STATE DEPARTMENT OF EDUCATION, COOPERATING

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2029

FOREWORD

It has been found increasingly true that the way to train the adult man or woman is thru the boy or girl. More and more we are realizing the truth of the statement that the child is father to the man.

The education of the child accomplishes a twofold result: the knowledge, the methods, and the habits of thinking and acting inculcated in childhood persist to manhood and womanhood; and the grown person in the home is quickened by the new facts which the children learn and take to their parents.

Any great movement — and this seems particularly true in agriculture and in home making — makes its advancement by evolutionary rather than revolutionary processes. Progress rarely comes by flashes, but by steady growth, and this is one reason why agricultural extension seeks to serve thru the children. The work that is done on the farm and in the home in connection with live topics and living things, and in a systematic way, tends to arouse a permanent interest in matters that have to do with the farm and with the home. In so far as it does this, it will also tend to keep the children interested, and to show them the value of knowledge practically applied.

These are the ideas that underlie the junior extension in agriculture and in home economics, and it is to help carry out these objects that the Cornell junior extension bulletins are published.

This bulletin on the vegetable garden should be widely used, as there are very few children to whom it will come who cannot find ground enough for a garden and time enough to care for it thoroly. The experience in planning the garden, selecting the crops to be grown, preparing the soil, planting and caring for the crops, and harvesting and disposing of the products, will reveal many of the essential principles and practices involved in the whole art of farming, and will lay the necessary basis for larger and more responsible work in future. It will be both good training and good education, and decidedly worth the while.

A. R. MANN,
Director of Extension Service.

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THE VEGETABLE GARDEN

M. D. Butler

The location and the plan of the garden are the first points for the inexperienced gardener to consider. Then follows the selection of crops to be grown, and the quantity and kind of seed. These points should be decided well in advance of the planting season. In this bulletin suggestions are given concerning each of these questions as well as that of soil preparation and improvement, and directions for growing some of our most popular vegetables.

LOCATION OF THE GARDEN

The garden is usually looked after during spare hours, and locating it near the house is a convenience since it is likely to be neglected if too remote from the dwelling. Another point to be considered is soil type; this, however, should not be given preference over nearness to the house, since practically any type of soil can be put into suitable condition for growing garden crops. The slope of the ground is a third point to be considered in selecting a location for the garden. If the garden is to be near buildings, it should be on the south or the east side, in order to get the most sunlight and protection from cold winds. While it is preferable to have the rows run east and west, with the tall-growing crops on the north side, the rows should run at right angles to the slope of the land if it is rolling or hilly. If the rows must run north and south, the tall-growing plants should be on the east side.

PLANNING THE GARDEN

In a garden of the size of the average city or town garden, particular care should be taken not to waste land. In order to keep the soil working thruout the growing season, to use all the available space most efficiently, and to insure a succession of fresh vegetables, a well-arranged and systematic planting plan is necessary. The plan should be drawn on paper during the winter in order that the gardener will know the kind and quantity of seed to order.

The selection of the crops to be grown will depend somewhat on the preferences of the family and the size of the garden. The arrangement of the crops is determined mainly by the time of maturity. For example, by grouping the early crops, such as lettuce, radishes, and onions from sets, the same ground can be used for late beets, beans, or cabbage; bush

beans may be followed by turnips, beets, or winter radishes; and early cabbage may be followed by spinach. The grouping of plants in this way also makes it possible to rotate the crops. This should be indicated on the planting plan.

Suggestive plans for gardens of four sizes, to help the gardener in arranging his space and selecting his crops, are given in figures 72 to 75, inclusive. The diagrams and tables that follow should be studied carefully before the garden plan is made. Adapt the suggestions of this bulletin to your location, and do not use the plans as they are unless they happen to suit your area and the vegetables mentioned suit the tastes of the members of the family.

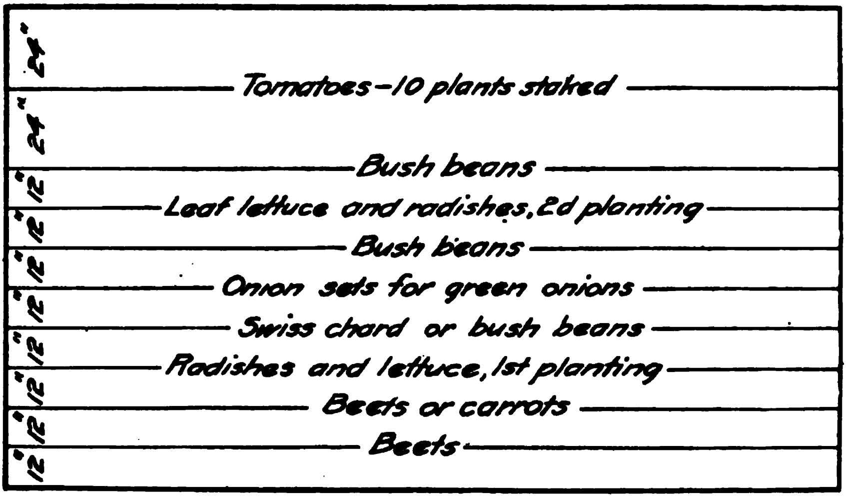

FIG. 72. PLAN FOR A GARDEN TWELVE BY TWENTY-ONE FEET IN AREA

Lettuce, radishes, and onion sets are to be planted early and will be out of the way before beans require the space

The plan illustrated in figure 72 is for a small garden, designed to meet the needs of a small family for a few vegetables. Space is economized, and the soil is used continuously. The vegetables selected are those that give the largest returns on small areas. In a garden of this size it would be poor practice to plant corn or potatoes, since the entire garden planted to these crops would not produce enough to be worth while. It requires only a few radishes or green onions for one meal, and the garden value of these crops is considerably larger than that of crops which require the entire season to mature or a larger area in which to grow. If the family does not like beets or carrots, something should be substituted for these crops. If the radishes, lettuce, and onions are to be followed by bush beans, it would be well to hasten the harvest of the

earlier crops if they are not consumed by bean-planting time. In a garden 20 feet long, plant at least two rows of beans at one time. Ten tomato plants, if staked and trained, will produce enough fruit for salad for a small family and the space will be profitably used.

The diagram shown in figure 73 is for a garden containing 500 square feet. The succession of crops suggested is similar to that for the smaller plan; however, in a garden of this size it is practicable to have a larger variety of crops. If beets or carrots are sown early, they may be followed by late crops. In like manner, early cabbage may be followed by

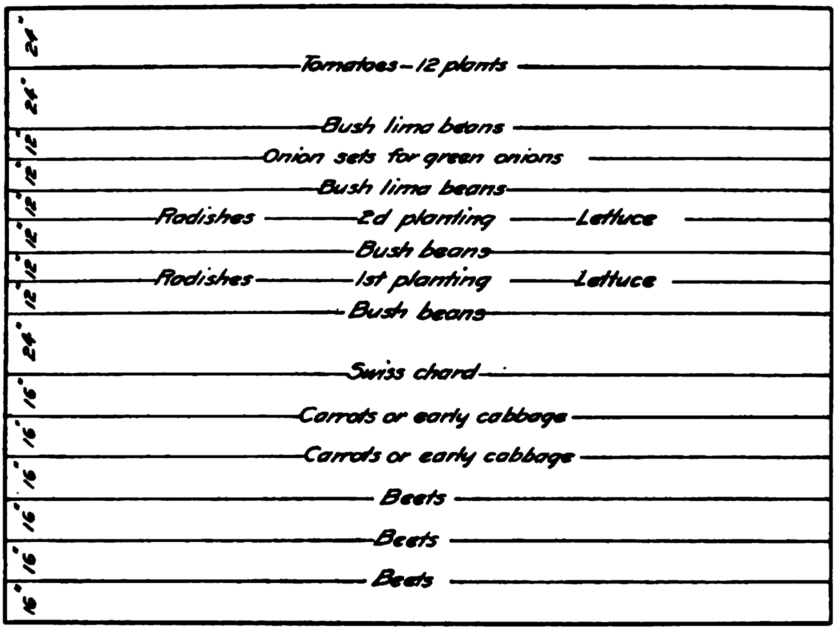

FIG. 73. PLAN FOR A GARDEN TWENTY BY TWENTY-FIVE FEET IN AREA

beets, carrots, or turnips. In case the first crop is not harvested at the planting time of the second, the later crop may be planted between the rows of the first. The first and second plantings of lettuce and radishes should be made two weeks apart. The space in the row allotted to either crop will depend on the family preference. In this plan the crops that should be started in a hotbed are cabbage and tomatoes; lettuce also may be started in the hotbed and transplanted, or the seed may be sown in the garden.

The plan shown in figure 74 represents the minimum size of the group of larger gardens, this plan containing 1000 square feet. Spinach and

peas are added, and may be followed by beets, beans, or cabbage. Swiss chard, onions from seed, carrots, and beets occupy the ground for the entire season. If early beets or carrots are desired, they may be substituted for early peas. If the garden is much larger than is shown in the plan, the rows should be lengthened in preference to adding more crops. In this plan the vegetables that may produce a sufficient quantity for canning are beets, Swiss chard, beans, and spinach; those that may be stored are late cabbage, beets, carrots, onions, and turnips. If the garden is sufficiently large to supply more than the family can use during the growing season, crops may be grown for canning and storing.

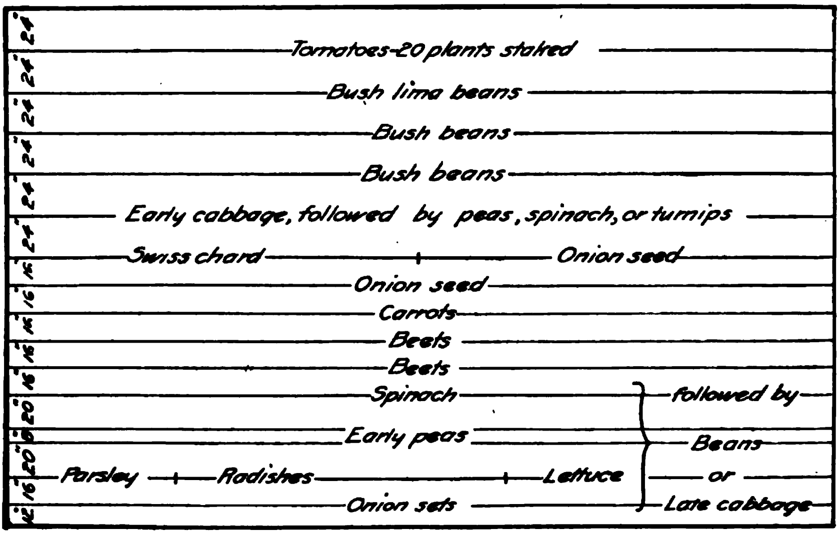

FIG. 74. PLAN FOR A GARDEN TWENTY-FIVE BY FORTY FEET IN AREA

In some localities early crops of beets and carrots may be followed by later plantings of the same vegetables. Other suggestions for utilizing all the space during the entire growing season are given on the plan

The planting plan shown in figure 75 is for a garden one-half acre in size. This plan is designed for the farm garden where horse cultivation is used.

In case the available area is only one-fourth acre in extent and the selection of crops is similar to the plan shown, the following practices should be followed: (1) The crops from asparagus to tomatoes, inclusive, should be planted from 12 to 24 inches apart, depending on the crop (table 1); this would necessitate the use of the wheel hoe and heavier fertilization. (2) The rows should be made shorter, and smaller plantings made of potatoes and sweet corn.

In this plan the plants that should be started in the hotbed are early cabbage, tomatoes, lettuce, eggplant, peppers, and early cucumbers. The

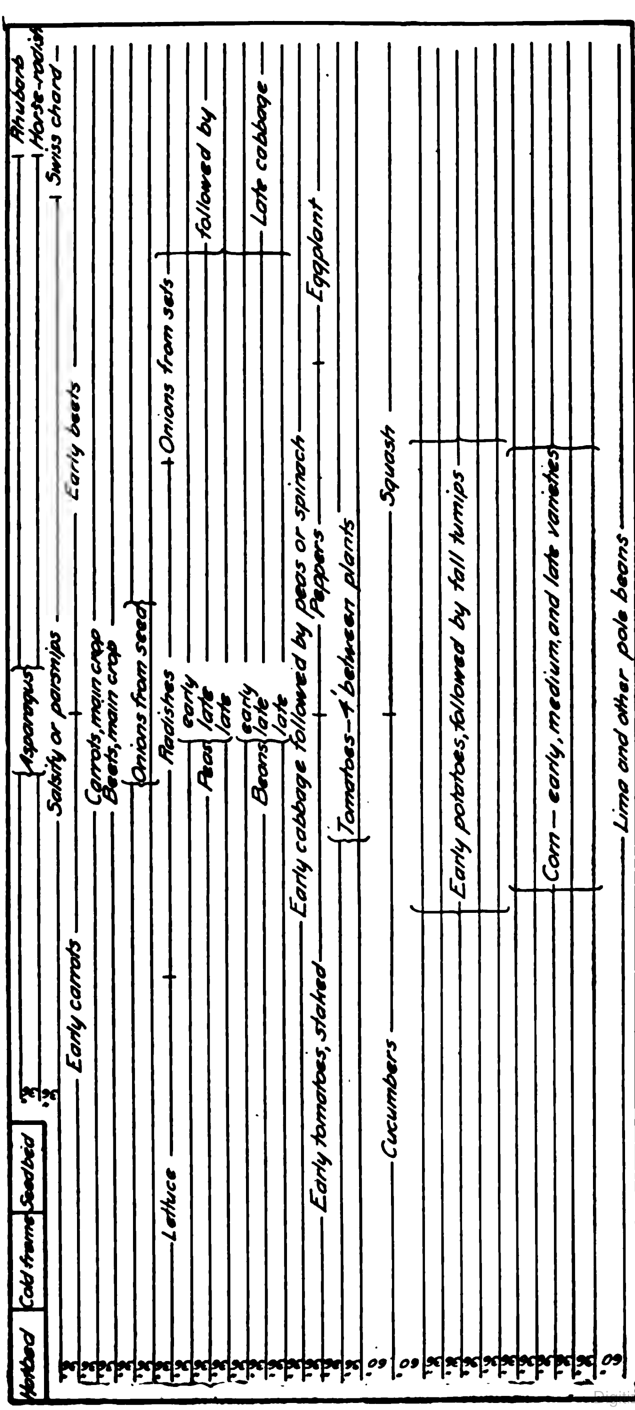

FIG. 75. PLAN FOR A GARDEN ONE-HALF ACRE IN EXTENT

In order to permit horse cultivation, rows are spaced three feet apart for all vegetables except cucumbers, squash, and pole beans, which are in rows five feet apart. The hotbed, the cold frame, the seedbed, and the perennial crops are grouped, in order to facilitate cultivation

coldframe should be used to harden off the young plants, and, if space permits, a limited supply of green onions or radishes can be grown to maturity earlier in the coldframe than in the open. A seedbed in the open should be used for growing late cabbage plants.

SELECTION OF VARIETIES

For a garden 250 square feet in area, one standard variety of each vegetable to be grown will be sufficient. Select a variety that has proved

FIG. 76. A SMALL AREA, BUT COMPLETELY UTILIZED

to be good, and preferably one that has been grown in your immediate vicinity. Be sure that you know the characteristics of a variety when selecting; for example, some persons prefer a head lettuce to loose-heading sorts, or a crookneck squash to a hubbard.

AMOUNT OF SEED REQUIRED

The approximate quantities of seed necessary for a succession of fresh vegetables, and for storing and canning, for a family of four, are given in the following list. The entire supply of radishes, lettuce, peas, corn, and beans should not be planted at the same time, but successive plantings should be made.

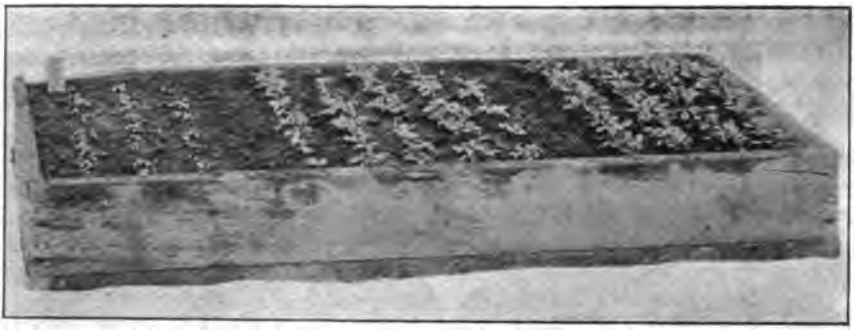

FIG. 77. A FLAT FOR STARTING PLANTS IN THE HOUSE
A similar one could be made from a box

Beans:	
Bush	1 to 2 quarts
Bush lima	1 pint
Pole lima	1 pint
Beets	4 ounces
Cabbage:	
Early	1 packet
Late	$\frac{1}{2}$ ounce
Carrots	1 ounce
Cauliflower	1 packet
Celery	1 packet
Corn, sweet	1 to 2 pints
Cucumbers	$\frac{1}{2}$ ounce
Eggplant	1 packet
Kale	2 ounces
Lettuce	$\frac{1}{2}$ ounce
Muskmelon	$\frac{1}{2}$ ounce
Onion, sets	4 to 6 quarts
Parsley	1 packet
Parsnips	$\frac{1}{2}$ ounce
Peas	2 to 4 quarts
Radishes	1 ounce
Salsify	1 ounce
Spinach	$\frac{1}{2}$ pound
Squash, summer	$\frac{1}{2}$ ounce
Tomatoes:	
Early	1 packet
Late	$\frac{1}{4}$ ounce
Turnips	2 to 3 ounces
Watermelon	1 ounce

GROWING EARLY PLANTS

If the garden is very small, it may be advisable to buy plants for setting, rather than to grow them. In this case good, vigorous plants should be chosen, of the correct variety and produced by a good grower.

Plants for the very small garden can be grown at home most easily in a window box. The box should be shallow and should have holes

FIG. 78. ONIONS, BEETS, LETTUCE, AND CABBAGE READY TO BE TRANSPLANTED
All these may be planted early and should not be left too long in the transplant boxes

in the bottom for drainage. Fill the box to within ½ inch of the top with fine loam. Firm the soil and have it perfectly level before marking the rows, which should be about ½ inch deep and from 1 to 2 inches apart. Mark the rows with a straight stick as long as the box is wide. Place the box before a window where it will get the most sunlight, and keep it at living-room temperature. Turn the box two or three times each week so that the plants will get equal amounts of sun-

FIG. 79. EFFECT OF TRANSPLANTING ON THE ROOTS OF CELERY
The plants on the left were transplanted; those on the right were not

light on all sides. Water the plants frequently, but do not keep the soil wet; watering every two days, preferably in the morning, should be sufficient. Use care in watering, to avoid injuring the young plants. If the plants become crowded in the row, they should be thinned to 1½ or 2 inches apart. This method can be used for growing cabbage, lettuce, and tomato seedlings.

If a large number of plants are to be grown, a hotbed should be employed rather than window boxes. The hotbed requires protection and

heat. Locating it on the south side of buildings or of tight fences furnishes protection, and by sloping the bed to the south the most sunlight will be obtained. The simplest way of heating the hotbed is by using manure. The manure can be put either into a pit or on top of the ground, but in either case it should be turned a few times at intervals of several days before being put into the hotbed. If the manure is placed in a pit, the pit should be at least 3 feet deep and the manure should be put in evenly and well trampled to prevent uneven settling. The pit should be 6 feet wide, and as long as is necessary. The frame for the hotbed should be made of stout lumber, 2 x 6 inches, with the top sloping to the

FIG. 80. THORO PLOWING IS ESSENTIAL TO GOOD VEGETABLE CROPS

south. When this is in place, cover the manure with 5 or 6 inches of fine, rich, garden loam, leaving at least 6 inches between the surface of the soil and the lower end of the sash. Cover the frame with hotbed sash 3 x 6 feet in size. When the temperature of the manure has become steady, the seed can be planted, preferably in flats placed on the soil in the bed. The hotbed should be ready for use in early March. Two sash, or a bed 6 x 6 feet in size, is large enough for most home gardens.

The hotbed is very useful as a part of the larger garden, but it must be well managed if good results are to be obtained. The essential factors in hotbed management are to give the plants all the sunlight possible, to keep them from drying out, and to keep them at the proper temperature. If the nights are very cold, the sash should be covered with mats or straw.

The coldframe, which is used to harden off the plants after they have been taken from the hotbed and before setting them in the garden, is made in the same way as the hotbed except that no heat is supplied. In the coldframe the plants should be given more space than they had in the hotbed, to encourage a stronger root growth. Frequent ventilation of the frame in the daytime, by supporting one end of the sash with a stake or a block, will gradually accustom the plants to outdoor conditions before they are set in the garden. On cool days open the frame only a little, but on warm days remove the sash; a few days before setting the plants, the sash may be entirely removed unless there is danger of frost at night.

More complete information on the construction and use of hotbeds and coldframes is given in *Hotbeds and Cold Frames*, Cornell Reading Course for the Farm, Lesson 120. This may be obtained free of charge on application to the New York State College of Agriculture, Ithaca, New York.

PREPARATION OF THE SOIL

Heavy soils should be spaded or plowed in the fall, but light soils need not be plowed until early spring. Fall plowing is advisable in many home gardens, since it exposes the hard soils to the action of frosts and destroys many insects. On heavy soil, stable manure and crop refuse should be used to build up the humus content and to improve the texture. Manure or other coarse material should be turned under when the garden is spaded or plowed. Use manure at the rate of from 20 to 30 tons to the acre or 200 pounds to 100 square feet. If stable manure is applied after plowing, it should be fine and well rotted.

If the plowing is done in the fall, the soil need not be touched until spring, when it should be replowed and raked, the clods and lumps broken up (not removed), and the garden leveled. Keep raking and stirring the ground until the crops are planted.

FERTILIZERS AND SOIL IMPROVEMENT

Intensive cropping is advised for the small garden; and if this practice is to be followed, liberal quantities of fertilizer, preferably stable manure, must be used. If stable manure cannot be obtained, a substitute must be used. Humus can be obtained most easily from crop refuse and by turning under green crops, such as clover or rye. The plant food required consists of nitrogen, phosphoric acid, and potash, and these may be supplied by using a complete fertilizer, containing from 2 to 4 per cent of nitrogen, from 6 to 8 per cent of phosphoric acid, and from 2 to 4 per

cent of potash. Apply this fertilizer at the rate of 4 or 5 pounds to 100 square feet. A similar fertilizer may be made by mixing the following:

10 pounds nitrate of soda
50 pounds tankage
100 pounds acid phosphate, 16 per cent
100 pounds hardwood ashes

This quantity may be decreased if a limited supply of manure can be found. Broadcast the fertilizer before raking the ground, and rake it in.

Coal ashes or lime when added to the soil in small quantities, will loosen it and make it workable. Heavy backyard soils, such as are found often in cities, need yearly applications of such materials until the soil texture reaches the desired state. Manure and crop refuse should be used freely on such soils.

PLANTING THE GARDEN

The time for setting the plants in the garden and for sowing seed depends on the dates of the last frosts. It is desirable to plant as early as possible in order to get a succession of crops. Certain crops must be planted early to avoid hot weather, as they thrive best in early spring, while others thrive best during the hot summer. Some crops will grow before the soil gets warm, while others will not. It would be well to consult an experienced gardener as to the average dates of frosts and the proper time of planting for your region.

The following arrangement of vegetables will guide the gardener in making the first planting of the various crops:

(a) Crops that can be planted in the open two or three weeks before the last frost are: onion sets, radishes, turnips, lettuce (seed and plants), smooth peas, kale, early potatoes, spinach, early cabbage plants, parsley, and asparagus and rhubarb roots.

(b) Crops that can be planted just before the last frost are: early beets, early carrots, chard, onion seed, salsify, late potatoes.

(c) Crops to be planted after danger of frost has passed are: bush beans, carrots, sweet corn.

(d) Crops to be planted after all danger of frost is over, and the soil has become warm are: tomatoes, eggplant, peppers, cucumbers, squash, lima beans, melons.

The quantity of seed or the number of plants required for 100 feet of row, the time and the depth of planting, the distance between rows, and the distance between plants in the row, are given in table 1.

TABLE 1. QUANTITY OF SEED AND NUMBER OF PLANTS NECESSARY FOR 100 FEET OF ROW, DEPTH OF PLANTING, AND DISTANCE OF PLANTING

Crop	Required per 100 feet of row		Time of planting (group)	Depth of planting (inches)	Distance between rows, hand cultivation (feet)	Distance between plants in row
	Quantity of seed	Plants				
Asparagus roots	....	60–80	a	10–12	2	12–15 in.
Beans:						
Bush	1 pint	....	c	1½–3	2	3–4 in.
Bush lima	½–1 pint	....	d	1½–3	2½	6–10 in.
Pole lima	½ pint	....	d	1½–3	3	3–4 ft.
Beets	2 ounces	....	b	1–1½	1–1½	3–5 in.
Cabbage	½ ounce	65–90	a	½	2–3	18–24 in.
Carrots	1 ounce	....	b	½	1–1½	2–3 in.
Chard	1 ounce	....	b	½	1½–2	6–10 in.
Corn, sweet	¼ pint	....	c	2	2½–3	10–12 in.
Cucumbers	½ ounce	50–70	d	1–1½	4–5	Drills, 18 in. Hills, 5 ft.
Eggplant	¼ ounce	50–70	d	½	2–3	18–24 in.
Kale	½ ounce	....	a	½	1½–2	8–10 in.
Lettuce	½ ounce	125–200	a	½	1–1½	6–10 in.
Melons:						
Muskmelon	½ ounce	50	d	1–1½	5–6	Drills, 24 in. Hills, 5 ft.
Watermelon	1 ounce	30–35	d	1–2	8–10	Hills, 8–10 ft.
Onions:						
Seed	1 ounce	....	b	½–1	1–1¼	3–4 in.
Sets	2 quarts	....	a	1–2	1–1¼	3–4 in.
Parsley	¼ ounce	....	a	¼	1–1¼	3–4 in.
Peas	1–2 pints	....	a	2–3	2–3	1 in.
Peppers	1 packet	50–70	d	½–1	2–3	18–24 in.
Potatoes:						
Early	5–6 pounds	....	a	4	2–3	12–18 in.
Late	5–6 pounds	....	b	4	2–3	12–18 in.
Radishes	1 ounce	....	a	½–1	1–1¼	1 in.
Rhubarb	....	30–50	a	....	2–3	2–3 ft.
Salsify	1 ounce	....	b	½–1	1–1½	2–3 in.
Spinach	1 ounce	....	a	1–2	1–1½	2–4 in.
Squash:						
Bush	½ ounce	15–25	d	1–2	3–4	Hills, 4 ft.
Running	½ ounce	15–25	d	1–2	8	Hills 8 ft.
Tomatoes	½ ounce	35–50	d	½–1	2–3	2–3 ft.
Turnips	½ ounce	....	a	¼–½	1–1½	3 in.

After the garden plan has been made, the seed obtained, the date of planting determined, and the garden plowed or spaded, one should have the following equipment for planting: a hoe, a rake, a strong line, two stakes for the line, and a measuring stake.

Rake and level thoroly the part of the garden that is to be planted. Locate the ends of rows with the measuring stake according to the distances shown in your plan. Put the line where the row is to be and mark along this line with a hoe, making the furrow the proper depth for the crop to be sown and making the row perfectly straight. The seed can be covered by raking lightly.

Plant in rows as illustrated in figures 72 to 75, not in beds unless the soil is poorly drained. If it is necessary to use beds, run the rows the long way of the bed, not across. Planting in beds wastes ground, and if the beds are very narrow they dry out easily.

In table 2 is given a grouping of crops that should help materially in planning and planting a garden so that the ground may be used continually and the crops rotated.

TABLE 2. GROUPING OF CROPS

Crops to occupy the ground the entire season	Early crops to be followed by others	Late crops to follow others
Beans, pole	Beans, bush	Beans
Beans, lima	Beets, early	Beets
Corn	Cabbage, early	Cabbage, late
Cucumbers	Carrots, early	Carrots
Eggplant	Lettuce	Celery
Melons	Peas	Kale
Onions from seed	Potatoes, early	Lettuce
Parsnips	Radishes	Peas
Peppers	Spinach	Spinach
Potatoes, main crop	Turnips	Turnips
Pumpkins		
Salsify		
Squash		
Tomatoes		

FIG. 81. GARDEN TOOLS

CARE AND CULTIVATION OF THE GARDEN

The soil should be cultivated after each rain as soon as it has become dry enough. Shallow and frequent cultivations are necessary to establish and maintain a good dust mulch, which prevents the loss of soil moisture and keeps down weeds.

For gardens less than 500 square feet in area, hand hoes and rakes are the only tools needed for cultivation.

A hand cultivator is the most practical tool for a garden from 1000 to 10,000 square feet in area. Various attachments can be obtained for

FIG. 82. SEVERAL FORMS OF WHEEL HOES

the hand cultivator which will make it possible to work close to the plants easily and without injury to the crops. Other tools that will be found useful are the hoe, the rake, the trowel, the hand weeder, and the claw weeder. However, not all of these are essential.

After the crops have been removed, the vines and the crop refuse should be pulled up and put in a compost pile. If insects or diseases have been bad, however, it is much better practice to burn this material, so that all eggs and larvae of insects and all disease spores will be destroyed. After this has been done, sow a green crop, preferably rye, which should be plowed or spaded under late in the fall or early in the spring. This crop greatly improves the texture of the soil.

For the control of garden insects and diseases, one should obtain a small hand sprayer, and use it early and often according to the instructions of the leader. Bulletin 283, published by the Cornell University Agricultural Experiment Station, gives proper directions for the control of these enemies. It will be sent free on application to the New York State College of Agriculture, Ithaca, New York.

CULTURAL DIRECTIONS FOR VARIOUS CROPS

ASPARAGUS

A deep sandy loam soil is best for asparagus. By intelligent handling, however, a heavier soil can be put in proper condition to grow this crop profitably. A heavy application of manure should be thoroly worked into the soil before planting.

Asparagus should not be planted unless the garden is permanently located.

The usual method of growing this vegetable is to set large roots, 1-year-old roots being best, from 12 to 14 inches apart in a trench from 12 to 15 inches deep. Cover them with about 2 or 3 inches of soil at first, and as the shoots come thru the surface put on more soil until the trench is finally filled. The roots may be obtained from a good seed house and should be set in early spring.

The edible part of asparagus is the young, tender shoot. No shoots should be cut until the plants are two years old. Mulching the row with straw, strawy manure, or with soil, produces blanched shoots, but the green stalks are easier to grow, have a more pleasing flavor, and are generally more popular. Cut off all the shoots during early spring, for if they are allowed to grow the plants will stop producing. By careful fertilization and good cultivation the planting should last indefinitely. Asparagus should be cultivated and fertilized each year after the cutting season.

From one to two hundred plants are needed to supply the ordinary family.

The leading variety of asparagus is Palmetto, but Giant Argenteuil and Reading Giant are good varieties and are more resistant to rust than is Palmetto.

BEANS

Beans are tender and should be planted after all danger of frost is over. Plant beans 2 or 3 inches deep on light soils, and from 1 to 2 inches deep on heavy soils; in the heavier soils it is harder for the young seedlings to break thru. Plant bush beans in rows from 20 to 24 inches apart where hand cultivation is used, and from 30 to 36 inches apart for horse cultivation. Beans are commonly planted from 3 to 4 inches apart in the row. Bush lima beans require more space, and should

be planted from 6 to 10 inches apart in rows from 30 to 36 inches apart. Pole beans should be planted in hills 3 or 4 feet apart, from 8 to 10 seeds being put in a hill and the plants thinned to 3 or 4 to a hill. If the space is limited, pole beans may be planted along the garden fence.

For a green-podded bush bean, Stringless Greenpod is a good variety. If a wax-podded sort is preferred, Wardwell Wax is good. For lima beans, Henderson Bush Lima is a good bush variety and Early Leviathan is a good pole variety.

FIG. 83. BEETS
Both the roots and foliage of young beets may be eaten

BEETS

Beets can safely be planted as soon as danger of heavy frost is past. Plant in rows from 12 to 16 inches apart. When the plants are well up, thin to 3 to 5 inches in the row. The thinned plants can be used as greens. If the garden is large enough, a succession of plantings is an advantage. In this State a fall crop of beets sown in July following such crops as lettuce or peas, will make good greens, roots for table use, canning, or pickling, but seldom will become large enough for storage.

Four ounces of seed, or 200 feet of row, will supply the ordinary family and furnish some roots for storage.

A good variety of beets is Crosby Egyptian.

CABBAGE

For early cabbage, the plants must be started in a window box, a hotbed, or a greenhouse. It requires from four to six weeks to grow the plants in this way. The plants should be set in the field slightly deeper than they were in the plant box. Make a hole with a trowel and set the plant. Firm the soil around the roots of the plant, and pour in a little water (½ pint). After the water settles, cover the moist soil with dry earth to prevent the forming of a crust around the plant. Transplant the cabbages preferably on a cloudy day or late in the afternoon. Early cabbage may be set in rows from 24 to 30 inches apart and from 14 to 18 inches apart in the row. The early crop should be harvested and used as soon as the heads are solid, since cabbage will not keep in summer.

The seed for the late crop can be sown in the open seedbed and the plants later transplanted to the garden. One-half ounce of good seed should grow enough plants for 100 feet of row, which should supply enough late cabbage for the average family. Early cabbage would require less space. Set late cabbage from 18 to 24 inches apart in rows 36 inches apart. Large quantities of fertilizer will often cause late cabbage to burst.

Good varieties of cabbage are: early, Copenhagen Market or Early Jersey Wakefield; late, Danish Ball Head.

CARROTS

Plant carrots for the main crop, after danger of frost is over, in rows from 12 to 18 inches apart. Carrots do not require much thinning. Cultivate frequently, and weed by hand. If more carrots than are wanted for table use are grown, they can be utilized for feeding cattle or horses.

Early carrots can be provided by selecting an early variety and planting early on good soil. Early sorts planted in summer following early crops will make roots for table use in the fall. A late variety should be planted for the main crop for storage.

One-half ounce of seed is sufficient for a family of four.

Varieties recommended are: early, Chantenay; late, Danvers Half-Long.

CHARD

The leaves of chard are cooked and prepared for greens; the leafstalks are often prepared and served similarly to asparagus. This vegetable is becoming very popular in the home gardens of New York State.

Chard is planted in the same manner as is the garden beet, but since it is a larger-growing plant it should be given more space in the row and the rows should be farther apart.

A row from 25 to 50 feet long will furnish sufficient chard for four persons. This would require from $\frac{1}{8}$ to $\frac{1}{4}$ ounce of seed.

A good variety of chard is Lucullus.

CUCUMBERS

Cucumbers thrive in a warm, well-drained, rich soil. It is a good plan, when making the rows for cucumbers, to open a furrow and cover

FIG. 84. SWISS CHARD, A BEET BRED FOR FOLIAGE INSTEAD OF FOR ROOT

The leaves and stalks may be cut repeatedly, and the leaves used like spinach, the stalks like asparagus

the bottom with well-rotted manure. Mix this manure with the soil so that none comes in contact with the seed.

One should never plant this crop in the open until all danger of frost is past and the soil has become warm. For very early cucumbers, the seed should be planted in the hotbed in paper bands or old strawberry boxes, the plants moved to the coldframe to harden off, and set in the garden in hills 4 feet apart each way. For the late, or pickling, crop, drill in rows 5 feet apart and thin to 18 inches in the row, or plant in hills

5 feet apart each way and thin to 3 or 4 plants to a hill. Frequent cultivation should be given until the vines fill the space, after which time they will need little attention except at picking time. The cucumbers should be picked every second or third day.

To protect the young plants from the cucumber beetle, cover them with mosquito netting and sprinkle air-slaked lime on the foliage. Drive a stake near the center of the hill and put the netting over this, covering the edges with earth.

Varieties of cucumbers recommended are: for slicing, White Spine; for pickling, Boston Pickling.

EGGPLANT

Plant the seed for eggplants in a box or a hotbed about eight weeks before they are wanted for setting in the garden. Transplanting once in the hotbed and later to the coldframe, allowing more root space each time, will develop a strong, vigorous root system and a vigorous plant. After all danger of frost is past and the soil has become warm, set the plants in the garden in rows 2 to 3 feet apart and from 18 to 24 inches in the row.

From 12 to 15 plants will be enough for the average family.

Black Beauty is a good variety.

KALE

The seed of kale may be sown very early in the spring, since the plants are hardy. Either sow in rows or broadcast the seed. The plant does not form a head, the leaves being used for greens. Kale may be sown in late summer for fall and winter use. Autumn frosts seem to improve the flavor of this vegetable.

Two ounces of seed will yield an ample supply of kale for most families.

Dwarf Curled Scotch is a good variety.

LETTUCE

Lettuce is frequently grown by sowing the seed thickly in the row and thinning the plants as they become large enough for use. Much better heads can be had, however, by starting the seeds early and transplanting to the garden, setting the plants from 6 to 10 inches apart in rows 12 to 18 inches apart.

Lettuce should be grown in early spring or fall, since this crop will not stand the heat of the summer. Loose-leaf sorts are recommended for spring planting, and the head varieties for fall.

One-half ounce of seed will furnish enough plants for 100 feet of row. This will supply the average family, but not all of it should be planted at the same time. Two spring plantings and one fall crop should be grown.

Varieties recommended are: loose-leaf, Grand Rapids; head, May King (spring) and Big Boston (fall).

MELONS

Melons can be grown in New York State only in the warmer sections. The culture of muskmelons is practically the same as that of the cucumber, except that the melons should be given more space. Plant in hills 5 feet apart each way, from 8 to 10 seeds to a hill, and after the plants are well established thin to 4 plants to a hill; or sow in drills 5 to 6 feet apart and thin to 1 plant every 24 inches, leaving the largest and thriftiest plants. One ounce of seed will suffice under ordinary conditions.

FIG. 85. A VACANT LOT TRANSFORMED INTO A PRODUCTIVE GARDEN

The culture of watermelons is the same as for muskmelons except that the watermelon requires more space. Plant in hills from 8 to 10 feet apart each way and thin to 3 or 4 plants to a hill. Two ounces of seed should be sown, requiring 200 feet of row.

Early melons may be had by starting the seeds in the hotbed, in pots or in paper bands.

The following varieties are recommended: muskmelon, Osage (salmon flesh), or Hackensack (green flesh); watermelon, Coles Early.

ONIONS

Sets for green bunch onions can be planted from two to four weeks before the last frost. Sets are usually planted in rows from 12 to 14 inches apart, and 3 to 4 inches apart in the row. The onions produced from sets are in most cases used as green onions.

For dry onions, plant the seed rather thickly in rows from 12 to 14 inches apart. Onions require frequent hoeing and hand weeding. When the crop has matured and the tops begin to die, pull the onions, let them dry on the ground in the field for a few days, then remove the tops, and store the bulbs in a cool, dry place.

For green bunch onions, from 2 to 4 quarts of sets will be sufficient. For dry onions, 4 ounces of seed, or 400 feet of row, will be sufficient for four persons.

Varieties recommended are: sets, White Portugal; seed, Yellow Danvers.

PARSLEY

Parsley is used mainly as a garnish. Plant the seed in the hotbed, and set the plants in the garden 3 to 4 inches apart in rows 12 to 15 inches apart; or sow a few seeds in the corner of the garden, cover them lightly with fine soil, and keep the soil moist until the plants come up.

A row from 5 to 10 feet long will produce enough parsley for an average family. A small packet of seed is sufficient for planting.

A good variety is Moss Curled.

PEAS

Garden peas are not injured by light frost and can be planted very early. The first plantings should be of quick-maturing varieties, and successive plantings should be made. Peas should not be grown in the small garden, since there would not be sufficient space available to yield enough for one meal at any time.

Allow about 10 seeds to a foot of row. Plant the seeds 2 or 3 inches deep in rows from 2 to 3 feet apart. Some gardeners plant in double rows 6 inches apart, making these double rows 2 or 3 feet from the rows on either side. This makes the trellising of the vines easier.

From 2 to 4 quarts of seed will be required for the average family.

Varieties of peas recommended are: early, Alaska, Gradus; late, Telephone, Admiral.

PEPPERS

Sow the seed for peppers in a window box or a hotbed eight weeks before time for setting in the garden. The plants should not be set until the soil is warm and all danger of frost is past, since this crop likes warm weather and is easily injured by frost.

The cultivation of peppers is the same as that for tomatoes or eggplants. Set the plants from 18 to 24 inches apart in rows from 2 to 3 feet apart.

A dozen plants will be sufficient.

Varieties recommended are: sweet, for stuffing, Bull Nose or Ruby King; hot, Cayenne.

POTATOES

Do not plant Irish potatoes on soil that has been freshly manured. Since as good potatoes can be bought as can be grown at home, this crop should not be planted in the small garden.

Plant the early crop as soon as the ground can be prepared, and the late crop in May or June. Plant the tubers 4 inches deep, and from 12 to 18 inches apart in rows from 2 to 3 feet apart. As soon as the plants are large enough to show the rows, cultivation should begin. Cultivate frequently, and spray the plants with bordeaux mixture and arsenate of lead (beginning early) to combat blight and potato beetles.

As soon as the potatoes are dug, put them in storage where it is cool. Keep the temperature uniform and never allow the potatoes to freeze. Do not allow the tubers to lie in the field exposed to the sun, as they will turn green and will become unfit for table use.

For early potatoes, plant from 20 to 30 pounds of seed tubers for a family of four; for the late crop, plant from 30 to 40 pounds of seed tubers.

The following varieties are recommended: early, Irish Cobbler; late Rural New Yorker.

RADISHES

Radishes, being early and easily grown, are very popular in the early garden but are seldom grown for summer use. Plant the seed in drills from 12 to 15 inches apart. The roots will not all mature at the same time, and by using the earliest as soon as they are large enough, room will be made in the row for the smaller ones to develop so that very little thinning is necessary. Radishes should not be closer than 1 inch in the row.

One ounce of seed will supply radishes for a family of four.

Scarlet Globe is a good variety.

RHUBARB

Rhubarb is usually started from roots, which can be purchased from a seedsman or obtained from a former planting. The roots should be set 2 or 3 feet apart. This crop should be planted at the side of the garden with the other perennials. It is used principally in early spring for sauce or pies. The stalks may also be canned. In the fall the roots may be dug, allowed to freeze, and placed in a cellar for forcing.

From 10 to 12 roots are enough for the average family.

SALSIFY

Sow salsify seed in the spring, as you would carrots, and cultivate frequently to eliminate hand weeding. The roots may be dug in the fall

and stored. If they are allowed to remain in the ground thru the winter, the plants will go to seed the next year and they can easily become a weed.

This vegetable when cooked has an odor somewhat resembling that of oysters and is sometimes called oyster plant. It is worthy of trial and where known is relished very much.

One ounce of seed will supply the average family of four.

Sandwich Island is a good variety.

SPINACH

Spinach, being our best crop for greens, should be found in every home garden that is large enough to supply the family. If the garden is to be hand cultivated, sow the seed at the rate of 1 ounce to 100 feet in rows 12 to 18 inches apart. Usually this plant is grown in the autumn after an early crop has been removed. The entire plant is used. Spinach is often canned for winter use.

From 1 to 8 ounces of seed may be planted, depending on the quantity desired.

Savoy and Bloomsdale are good varieties.

SQUASH

There are two types of squashes, the bush and the running. The bush squashes are planted in hills 4 feet apart, and the running squashes in hills 8 feet apart each way. One can readily see that this crop has no place in the small garden. The planting, cultivation, and care of squashes should be the same as for cucumbers or melons.

One-half ounce of seed should supply most families, this amount requiring 100 feet of row.

Varieties recommended are: summer, White Bush; winter, Hubbard, Delicious.

SWEET CORN

As soon as the danger of frost is past, plant the seed of the Golden Bantam variety of sweet corn in rows from 2½ to 3 feet apart, and thin the corn to 10 to 12 inches apart in the rows; or plant from 3 to 5 seeds in hills 2 feet apart, and thin to 2 or 3 stalks. Sweet corn loses its good flavor quickly after it has been removed from the stalk; hence it should be taken directly to the pot if possible. For this reason it is desirable to grow sweet corn in the garden if space permits. For a continued supply of sweet corn, one may make successive plantings of the same variety or may plant early, medium, and late varieties.

From 1 to 2 pints of seed will supply the average family of four persons.

The following varieties are recommended: early, Golden Bantam; mid-season, Semour's Sweet Orange; late, Evergreen, Country Gentleman.

TOMATOES

Plant the seed of tomatoes about eight weeks before time for setting in the field, using an early variety. The plants should not be transplanted to the garden until all danger of frost is past. A good method of growing the plants is to plant two or three seeds in paper bands, pots, or berry boxes, and thin to one plant. When transplanting time arrives, set the plant in the garden without disturbing the soil around the roots. One can also grow good plants by transplanting the seedlings once or twice before setting in the field, allowing more space at each transplanting and never allowing the plants to become crowded.

The plants should be set in the garden 2 to 3 feet apart in the row. A stake should be driven into the ground at each plant, on which the plant can be trained. The training of a plant consists of tying it to the stake and pruning out the suckers, or shoots, which come out just above the point where the leaf stem joins the main stem, or stalk, of the plant. Use old rags or tape to tie the plant, tying loosely just under the leaf stem. By pruning off the suckers as they start, one may train only one stem. The suckers should be pruned out every week or ten days and the plant tied up as soon as it needs more support and the fruit gets heavier. This will have to be done five or six times during the season. This training will induce larger fruit and more uniform ripening, will permit closer planting, thereby increasing the yield, and will keep the fruit off the ground.

In a garden of one-fourth acre or larger, the plants are sometimes set 4 feet apart and are not staked.

One packet of seed will furnish enough plants to supply a family of four with tomatoes during the summer, as well as furnishing some for canning.

Varieties recommended are: early, Bonny Best; late, Stone.

TURNIPS

For an early spring crop, the seed of turnips should be planted as early as the soil conditions will permit in drills from 12 to 18 inches apart. After the plants are well started, thin to about 3 inches apart. The seed should not be covered more than ¼ to ½ inch. For the fall crop, turnips are usually sown broadcast and covered very lightly. Turnips can be sown later than any other crop. The plant is very hardy and the roots may remain in the soil after several frosts before storing.

Two or three ounces of seed are usually sown.

The best variety is White Milan.

GARDEN PROJECT REQUIREMENTS

Any girl or boy living in New York State may undertake the garden project by meeting the following conditions:

a. You must be under twenty years of age.

b. You must obtain your parents' or your guardian's consent.

c. You must have the facilities at your command necessary for doing the work properly.

You should enroll for that division, or class, of the work that is designed for boys and girls of your age. If you desire to do the work of an older group or class, first obtain your leader's or your teacher's consent.

The divisions of the project are:

	CLASS A	CLASS B	CLASS C
Age	Up to 11 years inclusive	12 to 15 years inclusive	16 to 19 years inclusive
Size of garden	250 square feet	500 square feet	1000 square feet

Class A requires the worker to do all the work, except the plowing and similar heavy work, necessary for preparing, planting, and taking care of the garden thruout the season. At least three different kinds of vegetables are to be grown.

Class B or Class C requires all the work necessary for preparing, planting, and managing a garden of at least the size stated above during the whole season. At least eight different kinds of vegetables should be grown. Both intercropping and succession cropping should be practiced. The aim should be to have a constant supply of the most valuable vegetables thruout the season, with an abundance of vegetables stored and canned or dried for use in winter.

ACKNOWLEDGMENTS

Figures 79, 83, and 84 are from photographs furnished by the United States Department of Agriculture.

Figures 76 and 85 and the figure on the cover are from photographs furnished by the Eastman Kodak Company.

CIRCULAR 10 AUGUST, 1918

FARM BUREAU CIRCULAR

Published by the New York State College of Agriculture
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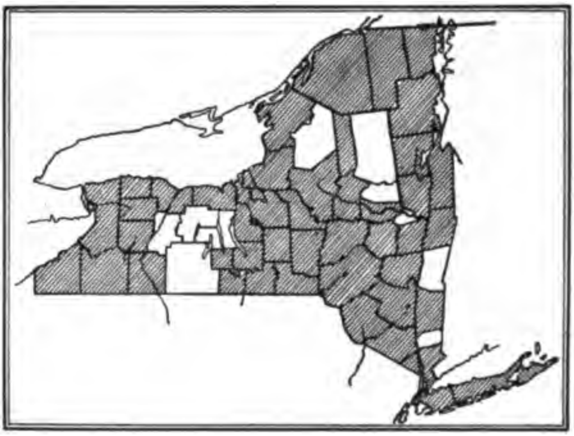
Annual Report of the County Agent Leader

For the Year Ending November 30, 1917



The shaded portions show the counties that have farm bureaus

Prepared under the Direction of
M. C. BURRITT
State County Agent Leader

Cooperative Extension Work in Agriculture and Home Economics for the State of New York: Farm Bureau Associations, New York State College of Agriculture, New York State Department of Agriculture, United States Department of Agriculture, Cooperating

FOREWORD

During the year a change has been made in the organization and relationship of the Farm Bureau Office to the College of Agriculture. The Farm Bureau Office has been an independent department in the College, but on July 1 it was consolidated with the Department of Extension Teaching and the Office of Information, and is now a division of the Department of Extension.

A county farm bureau is a partnership between the Extension Service of the New York State College of Agriculture, which also represents in this work the State and Federal Departments of Agriculture, and the farmers of the county thru their county farm bureau association. It is, therefore, both a part of the extension system of the State and a local institution for local development. The immediate supervision of county agent work is by a State leader of county agents and his assistants, who are responsible to the Director of Extension of the State College of Agriculture. This leader is also the administrative representative in farm bureau work of the State Commissioner of Agriculture and of the United States Department of Agriculture.

As the county agricultural agent leader, H. E. Babcock, has been granted leave of absence for the period of the war to serve as Director of the Bureau of Food Conservation of the State Food Commission, this report has been chiefly prepared by the assistant county agent leaders, Jay Coryell, L. A. Toan, and F. E. Robertson.

M. C. Burritt,
Vice Director of Extension.

ANNUAL REPORT OF THE COUNTY AGENT LEADER

DECEMBER 1, 1916, TO NOVEMBER 30, 1917

Forty-seven out of 56 agricultural counties in the State had perfected farm bureau organizations on November 30, 1917. Several other counties are in the process of organization, and it is expected that there will be a farm bureau association in each of the 56 counties before the end of 1918.

During the past year general policies and methods of organization have continued as heretofore. Attention has been directed more particularly to strengthening and perfecting the various county organizations and working out definite programs of activities, stress being placed on improvement in these respects rather than on new lines of work.

Due to war emergency conditions it was necessary to change to a considerable degree plans for 1917 that had been worked out the preceding fall. After the declaration of war, immediate steps were taken to mobilize the agricultural forces of the State. The entire farm bureau force cooperated with other agencies in taking the agricultural census, distributing seed, supplying labor to farmers, and in the distribution and operation of labor-saving machinery. The methods of conducting and the results of this special emergency work are treated in a separate supplementary report (p. 44).

ORGANIZATION

In normal times and all the more under war conditions it was felt that the farm bureau organization should be strengthened. This has been done thru well-planned membership campaigns and the earnest cooperation of community committeemen.

Failure to bring about increased membership or increased cooperation was in nearly all cases due to failure of the agents to carry out plans.

TABLE 1. Growth of Bureaus from March 1, 1914, to December 1, 1917

	March 1, 1914	January 1, 1915	January 1, 1916	December 1, 1916*	December 1, 1917
Number of counties organized	18	23	31	36	47
Total membership	2,620	5,557	9,995	13,681	29,781
Average membership	145	241	322	390	633

*Chautauqua County had a farm bureau but not an organized membership association at this time; hence the membership figures are for 35 counties.

On March 1, 1914, the average farm bureau membership was 145, and on December 1, 1917, about four years later, it was 633. These figures seem to answer the question as to whether the county agricultural agents and the farm bureau associations are meeting the needs of the New York State farmers.

A comparison of the 1916 and the 1917 membership, as regards number of members per county and percentage of the total number of farmers in the county belonging to the farm bureau associations, is given in table 2.

TABLE 2. MEMBERSHIP BY COUNTIES

County	Total number farmers in the county	Membership, December 1, 1916	Percentage of total number of farmers	Membership, December 1, 1917	Percentage of total number of farmers
Albany	3,146	359	11	406	13
Allegany	4,937	450	9	288	6
Broome	4,017	179	4	530	13
Cattaraugus	6,017	424	7	1,109	18
Cayuga	4,785	340	7	564	12
Chautauqua	7,500	....	....	1,000	13
Chemung	2,193	172	8	326	15
Chenango	4,258	580	14	885	21
Clinton	3,608	270	7	157	4
Cortland	2,610	532	21	500	19
Delaware	5,044	424	8	1,028	20
Dutchess	3,600	299	8	554	15
Erie	8,178	409	4	653	8
Essex	2,274	177	8	230	10
Franklin	3,675	204	6	682	19
Genesee	3,250	....	....	1,157	36
Greene	2,654	....	....	262	10
Herkimer	3,092	563	17	718	23
Jefferson	5,778	211	4	880	15
Madison	4,042	....	....	1,051	26
Monroe	5,971	568	10	754	13
Montgomery	2,189	300	14	442	20
Nassau	1,017	412	40	502	49
Niagara	4,346	516	12	998	23
Oneida	6,929	181	3	634	9
Onondaga	5,770	506	9	570	10
Ontario	4,416	....	....	650	15
Orange	3,934	765	19	1,228	31
Orleans	2,780	....	....	755	27
Oswego	6,319	190	3	450	7
Otsego	5,346	1,142	21	1,515	28
Rensselaer	3,543	....	....	525	14
Rockland	1,333	....	....	400	30
St. Lawrence	8,224	415	5	369	4
Saratoga	3,611	272	8	366	10
Schoharie	3,288	272	16	527	16
Schuyler	1,920	....	....	350	18
Suffolk	2,491	....	....	501	20
Sullivan	3,851	282	7	592	15
Tioga	2,844	403	14	927	33
Tompkins	2,988	137	5	635	21
Ulster	5,022	513	10	471	9
Warren	1,865	260	14	398	21
Washington	2,831	....	....	425	15
Wayne	5,237	....	....	1,050	20
Westchester	1,880	140	7	240	13
Wyoming	3,529	820	23	527	17
Total	188,132	13,681	....	29,781	....
Average	....	390	10.9	633	17.2
Number of counties reporting	47	35	35	47	47

The average percentage of farm operators in all the counties belonging to the farm bureau associations increased 9.5 per cent in 1916 and 15.8 per cent during 1917.

An increase in the number of counties reporting membership in the various farm bureau associations is shown in table 3.

TABLE 3. MEMBERSHIP IN THE COUNTY ASSOCIATIONS BY PERCENTAGE OF TOTAL NUMBER OF FARMERS

	January 1, 1915	January 1, 1916	December 1, 1916	December 1, 1917
Number of associations	23	31	36	47
Total membership	5,557	9,995	13,681	29,781
Average membership	241	322	386	633
Number of counties having membership under 5 per cent	10	8	5	2
Number of counties having membership of 5 to 9 per cent, inclusive	8	14	15	5
Number of counties having membership of 10 to 14 per cent, inclusive	4	5	8	11
Number of counties having membership of 15 to 19 per cent, inclusive	0	5	3	12
Number of counties having membership of 20 per cent or over	0	0	4	17

Only 2 counties in 1917 reported less than 5 per cent of the farmers as belonging to the bureau, while 17 counties reported 20 per cent or over. The growth in the number of farmers supporting the work has steadily increased during the past five years. Plans are now under way in most of the counties for carrying on the 1918 membership campaign, and it is probable that these figures will increase even more next year than they have during 1917. New York State farmers are assuming greater responsibility in directing farm bureau work in their counties and individual communities.

COMMUNITY ORGANIZATION

A few years ago a township seemed to be the logical geographical unit in which to organize and develop local leadership. It is agreed now that the community is the more logical unit. No political boundary lines need to be recognized in defining an agricultural community. Its boundaries may be more or less arbitrarily defined, but the logical center of the community is the common place of meeting or the marketing or shipping point around which most of the business and social activities of the community center. Among the various members in each community certain men are designated as farm bureau committeemen.

In the 47 counties thus far organized there are approximately 2000 designated agricultural communities with a total of about 5000 community committeemen. Committeemen are usually selected by the other members in the community. They are men who have fully grasped the farm bureau idea and are ready to take the initiative in all movements that promise to improve the agricultural practices of the community. It

is difficult to estimate the value to the agriculture of the State that will result from these organized efforts in years to come. Not only are these farmers thinking of improving the agriculture of their community, but in many cases they have already done it and are planning further development.

STRENGTHENING PARTNERSHIP WITH FARMERS

During this year it has been the policy of the central office of farm bureaus to keep in as close touch as possible with the executive and advisory committees of the various farm bureau associations. This has resulted in strengthening the partnership between the central office and the various county organizations and has brought about a better understanding between all parties concerned. Improvement has resulted along many lines, but three are worthy of special mention:

1. **The handling of finances.** Budget conferences were held in every county. A representative from the central office met with the executive committee primarily for the purpose of making out in detail a budget of estimated receipts and expenses for 1917. This resulted in the making of more definite plans and in better financial records being kept by the farm bureau associations. The financial account forms recommended by the central office are being used in most of the counties.

2. **County and community programs.** Definite plans of work have been followed as closely as emergency conditions would permit during the past year. The farm bureau advisory committees are actively taking the responsibility for outlining and carrying out these programs of work. A representative of the central office met with the committees in the various counties in order to give them assistance in making up programs of work for 1918. The interest shown by these committees in making up the programs is further evidence that farmers understand what the more important needs in their respective communities are.

3. **Assistance given to agents.** Visits have been made as often as possible to individual counties in order to give needed assistance. Plans were also made for one of the staff from the central office to spend a couple of days in each county helping the county agent to chart and map the year's work. This was particularly valuable since thru it the strong and the weak points of the work were determined. A summary of these points is given in table 4. Each agent was encouraged to call his community committees into conference so that he might fully explain to them the partnership idea of farm bureau organization, acquaint them with what the farm bureau had already done, and make plans for the following year's work. During the past year 743 such conferences were held and attended by 7160 farmers.

OTHER SUPERVISORY STAFF ACTIVITIES

The regular supervisory work of the central office has been greatly interfered with during the past year by the war emergency work and the large number of new things that have been carried out thru the county agent system, such as the census, numerous questionnaires, the labor and seed work, and the like. The great increase in the amount of emergency work both in the central office and in the local county bureaus made it impossible during the early part of the year to give adequate attention to the regular work.

TABLE 4. ORGANIZATION BY COMMUNITIES

County	Number of townships	Number of communities	Total number advisory committee-men	Number of committee conferences	Attendance
Albany	10	41	73	5	26
Allegany	29	58	97	4	20
Broome	15	60	107	13	100
Cattaraugus	33	93	176	25	481
Cayuga	24	38	134	38	737
Chautauqua	26	76	138	32	294
Chemung	11	26	82	....	....
Chenango	21	49	116	3	23
Clinton	14	28	99	18	271
Cortland	15	28	114	19	178
Delaware	19	85	170	3	25
Dutchess	20	30	77	15	122
Erie	23	53	130	25	100
Essex	18	51	82	20	134
Franklin	18	41	104	19	140
Genesee	*	*	*	*	*
Greene	14	23	63	3	12
Herkimer	21	51	155	13	64
Jefferson	22	52	107	12	213
Madison	16	29	131	18	75
Monroe	20	79	149	22	226
Montgomery	10	38	111	8	31
Nassau	3	17	99	44	559
Niagara	13	21	111	27	248
Oneida	27	83	118	38	270
Onondaga	21	32	108	5	218
Orange	20	47	70	....	....
Orleans	10	24	110	27	271
Oswego	29	59	78	36	367
Otsego	24	64	181	....	....
Rensselaer	12	44	93	15	134
Rockland	5	10	44	14	76
St. Lawrence	32	76	135	10	79
Saratoga	20	28	112	18	74
Schoharie	16	18	108	22	97
Suffolk	11	49	116	4	24
Sullivan	15	45	115	5	99
Tioga	10	27	133	26	128
Tompkins	9	36	132	39	436
Ulster	21	77	97	18	111
Warren	11	33	107	6	61
Wayne	15	37	145	36	230
Westchester	22	39	47	12	70
Wyoming	16	34	163	26	336
Total	761	1,929	4,837	743	7,160
Counties	43	43	43	40	40

* Report incomplete.

Altho 7 persons assisted in the supervision of the work during the year, the total number of days worked, 890, is equivalent to only 3 men

working the year around. The supervisory work may be divided into the following principal types:

1. Meeting executive committees to determine policies, programs of work, and other administrative matters.
2. Individual conferences with agents and the inspection of agents' work.
3. Attending and addressing general meetings in the counties, especially advisory committee meetings.
4. Organization of new counties.
5. Miscellaneous.

1. The farm bureau staff attended 175 executive committee meetings during the year, which is an average of between 4 and 5 such meetings for each county. The actual number, of course, varied all the way from 1 meeting in some counties to 8 or 10 in others. It is worth while noting that the average attendance at these meetings was 7. This is one of the most important and necessary lines of supervisory work carried on by the central office.

2. During the year 275 individual conferences with county agents, or an average of 7 for each county, were held. These include at least one inspection trip to every county, at which time the work was thoroly gone over with the county agent and maps and charts made covering the amount and distribution. Including these personal conferences, 318 visits were made to the 41 counties during the year, or an average of nearly 8 for each county.

3. Sixty-three general meetings, at which 8957 persons were present, were attended and addressed by members of the central office staff during the year. In addition to this, 55 committee meetings, attended by 1779 persons, were addressed by members of the central office staff. This latter is also effective work, and more of it should be done.

4. Twelve farm bureau associations including Chautauqua County, which changed from a non-membership to a membership bureau and has now 1000 members, were organized this year, bringing the total number of organized counties up to 47. Forty-four of the 47 counties had agents at work on December 1, 1917, and the other 3 are planning to have agents at work early in 1918. Practically every unorganized agricultural county in New York State is in the process of organization.

5. Miscellaneous work includes necessary conferences with various individuals and organizations with which the farm bureaus are cooperating or with which they have some relationships. During the emergency, the amount of this kind of work has very greatly increased, and the staff has been called upon to help with liberty loan campaigns, the increased use of wood as fuel, emergency work of the State Food Commission, home demonstration work, State seed stocks committee work, and the like.

Approximately one-half of the time was spent in the office. This time was required principally by the heavy correspondence and the receiving and making of reports. During the year 6102 letters were written in the central office, 85 circular letters were sent out to the county agents, and 12 to the farm bureau presidents.

TABLE 5. COUNTIES ORGANIZED DURING 1917

County	Office location	Date	Membership, December 1, 1917	Manager or agent
*Chautauqua	Jamestown	December 1	1,000	H. B. Rogers
Genesee	Batavia	October 1	1,157	E. L. Baker
Greene	Catskill	August 15	262	C. W. Gilbert
Madison	Cazenovia	January 4	1,051	D. F. Putnam
Ontario	Canandaigua	March 28	650	G. W. Peck
Orleans	Albion	January 20	755	L. J. Steele
Rensselaer	Troy	April 7	525	N. G. Farber
Rockland	Spring Valley	July 1	400	L. A. Muckle
Schuyler	Watkins	September 11	350	H. G. Chapin to begin work on January 1, 1918
Suffolk	Riverhead	February 23	501	R. C. Parker
Washington	Hudson Falls	November 15	425	J. M. Hurley to begin work on January 1, 1918
Wayne	Sodus	January 17	1,050	F. E. Rogers

*This county began farm bureau work in January, 1913, under the direction of an executive committee without a membership organization. The farm bureau association was formally organized on December 1, 1917.

CHANGES IN THE PERSONNEL

1. **Central office.**— On April 13, 1917, M. C. Burritt was appointed a member of the New York State Food Supply Commission by Governor Whitman and from that time to the dissolution of the commission in October gave much attention to the work of the commission. On July 1 he was appointed Vice Director of Extension of the State College of Agriculture. H. E. Babcock, Assistant County Agent Leader, was made County Agent Leader to succeed Mr. Burritt.

When the State Food Commission began its work on November 15, H. E. Babcock was selected to take charge of the work of the Bureau of Conservation and took a temporary leave of absence from farm bureau work. Mr. Burritt again assumed active charge of the work as County Agent Leader.

On May 18, Jay Coryell, formerly Assistant County Agent Leader in Vermont, was added to the central office force as Assistant County Agent Leader.

On August 1, E. R. Eastman, County Agent in Delaware County, was appointed to the central office staff as Assistant County Agent Leader.

On July 1, W. P. Frost began his services as Supervisor of Dairy Improvement Work in cooperation with the State Department of Agriculture.

2. **County agents.**— Cayuga County. On February 1, Curry Weatherby began work as county agent in Cayuga County, succeeding J. R. Teall, who resigned to become county agent in Onondaga County.

Cortland County. On April 16, Allan S. Merchant was appointed county agent to succeed E. H. Forristall.

Delaware County. On August 1, E. G. Brougham, Assistant County Agent in Delaware County, was appointed county agent to succeed E. R. Eastman, who resigned to become Assistant State Leader.

Essex County. On May 12, J. H. Phillips resigned to enter business and was succeeded by H. J. Tillson. Mr. Tillson resigned on September 21 to enter the army. Jay Gelder was appointed county agent to succeed Mr. Tillson and began work on October 13.

Genesee County. E. L. Baker began work as the first agent in Genesee County on October 1.

Greene County. C. W. Gilbert began work as the first agent in Greene County on August 15.

Madison County. D. F. Putnam was appointed as the first agent in Madison County and began work on February 1.

Montgomery County. W. J. Hager was appointed on April 16 to succeed Allan S. Merchant, who resigned to become agent in Cortland County.

Onondaga County. J. R. Teall was appointed county agent on February 1 to succeed S. A. Martin, who resigned to go into business.

Rensselaer County. N. G. Farber was appointed as the first agent in Rensselaer County on July 1.

Rockland County. L. A. Muckle was appointed on July 1 as the first agent in Rockland County.

St. Lawrence County. E. S. Bird succeeded Charles Phelps on March 1 as county agent.

Saratoga County. Charles Phelps began work as county agent in Saratoga County on March 1. This bureau had been for several months previous to this date without a manager. Dr. Hollister was the agent preceding this period.

Suffolk County. R. C. Parker was the first agent in Suffolk County. He began work on May 1.

Sullivan County. J. A. Richardson resigned as county agent on March 31 to become manager of a large farming proposition. He was succeeded by H. P. Smith, who resigned on August 1. From August 1 until December 31 the work in Sullivan County has been done by Charles Wille, Acting County Agent.

Wayne County. F. E. Rogers was appointed as the first agent in Wayne County on July 1.

On August 1, P. Schereschevsky was appointed Special Assistant County Agent for Jewish Farmers in Sullivan, Ulster, and Rensselaer Counties.

3. **Assistants.**— Assistants were appointed in most of the counties for short periods to help with the emergency work. They were paid by the Food Supply Commission up to August 15. Since then they have been paid from Federal war emergency funds. The names of the assistants and their periods of service follow:

Albany	Ralph Van Horn	August	15 to September 15
Allegany	G. E. Leaworthy	August	15 to September 1
Broome	J. L. Finneran	August	15 to September 15
Broome	L. D. Palmer	November	15 to December 12
Cattaraugus	Leo Metzgar	August	15 to September 15
Cattaraugus	R. W. Pease	August	15 to November 1
Cayuga	W. E. Knapp	August	15 to September 1

Chautauqua	Ernest Engdahl	August	15 to December 31
Chemung	A. S. Burchard	August	15 to September 15
Chenango	T. W. Billings	August	15 to October 15
Clinton	R. V. Call	August	15 to November 1
Columbia	W. I. Roe	August	15 to October 1
Cortland	W. T. Merrick	August	15 to December 31
Delaware	O. H. Chapin	August	15 to October 1
Dutchess	G. Hammond	August	15 to October 3
Erie	L. N. Baker	October	1 to December 31
Franklin	J. M. Hurley	September	15 to December 31
Fulton	N. R. Beers	August	15 to October 1
Greene	G. C. Porter	August	15 to September 15
Herkimer	C. F. Cochrane	August	15 to December 31
Herkimer	A. B. Davies	November	15 to December 31
Jefferson	E. S. Stone	April	15 to October 15
Jefferson	S. Farley	August	15 to October 1
Jefferson	J. E. Chapin	October	1 to December 31
Lewis	H. N. Young	August	15 to October 15
Livingston	H. N. Humphrey	September	15 to December 31
Madison	A. L. Hollingsworth	September	1 to December 31
Monroe	J. L. Laycock	August	15 to December 31
Montgomery	B. A. Allen	August	15 to December 31
Nassau	M. G. Briggs	August	15 to November 1
Niagara	L. H. Moulton	October	15 to December 31
Niagara	J. W. Robson	August	15 to October 15
Oneida	A. B. Davies	August	15 to November 15
Oneida	H. C. Morse	November	15 to December 31
Onondaga	F. G. Buchnell	August	15 to November 15
Ontario	A. B. Buchholz	September	1 to December 31
Orange	L. D. Greene	October	1 to December 31
Orange	J. G. Crissey	August	15 to October 1
Orleans	F. J. Rimoldi	September	15 to November 1
Oswego	H. J. Evans	August	15 to December 31
Otsego	W. D. Chase	August	15 to December 31
Rockland	A. P. Burroughs	August	15 to August 31
St. Lawrence	J. M. Hurley (part time)	September	15 to December 31
Saratoga	R. R. Jansen	August	15 to September 1
Schoharie	H. B. Woodford	August	15 to October 5
Schoharie	W. I. Roe	October	1 to December 31
Schuyler	H. G. Chapin	August	15 to December 31
Seneca	H. E. Hazlett	August	15 to August 31
Steuben	J. E. Olmstead	October	15 to November 1
Steuben	J. Gelder	August	15 to October 1
Suffolk	G. W. Creighton	August	15 to September 1
Sullivan	Charles Wille	August	15 to December 31
Tioga	J. P. Benson	September	15 to October 1
Tompkins	R. C. Beach	August	15 to November 15
Ulster	J. A. Lennox	August	15 to November 15
Washington	F. A. Roper	August	15 to September 8
Washington	H. Daley	September	15 to November 7
Wayne	E. S. Warner	August	15 to November 15
Wyoming	W. D. Halstead	October	1 to December 31
Wyoming	H. Brower	August	15 to September 25
Yates	A. F. Lockwood	August	15 to August 31
General	R. W. Pease	November	1 to December 31
General	F. J. Rimoldi	November	15 to December 31

FINANCES

As the growth of the bureaus continues, more attention is being given to the handling of finances, altho no material changes have been made in the methods of reporting and summarization. The farm bureau treasurers have been encouraged to use uniform systems of accounting. Forms for accounts have been recommended by the central office and sold to the various associations at cost.

A duplicate set of accounts is kept in the farm bureau office in nearly all the counties. This reduces the possibilities of mistakes and acquaints the manager with the status of the finances at all times.

The cash receipts and expenses of the 44 farm bureau associations that operated a part or all of the year ending December 31, 1917, and also the estimated receipts and expenses of 55 farm bureau associations for the year ending December 31, 1918, are shown in table 6. These are in accordance with budgets prepared during November for the consideration of boards of supervisors.

TABLE 6. CASH RECEIPTS AND EXPENSES OF FORTY-FOUR FARM BUREAU ASSOCIATIONS FOR YEAR ENDING DECEMBER 31, 1917, AND ESTIMATED RECEIPTS AND EXPENSES OF FIFTY-FIVE FARM BUREAUS FOR YEAR ENDING DECEMBER 31, 1918

	Total amount of actual receipts, and expenses, 1917		Total amount of estimated receipts and expenses, 1918	
RECEIPTS				
Boards of supervisors	$101,723.31		$133,625.00	
Membership	23,279.13		38,286.00	
Local contributions				
Business corporations	9,964.32		6,168.00	
Chambers of commerce	2,100.95		1,180.00	
Granges	375.11		50.00	
Advertising in *News*	6,540.80		9,276.00	
Miscellaneous	18,434.32		1,813.00	
Total cash receipts, 1917		$162,417.94		$190,398.00
Balance on hand January 1, 1917		5,829.62	present worth	6,998.00
Total		$168,247.56		$197,396.00
EXPENSES				
Salaries	$56,523.20		$69,139.00	
Traveling expenses	10,139.10		12,970.00	
Automobile	32,750.47		37,027.00	
Office	18,290.90		22,995.00	
Printing	17,564.97		22,364.00	
Extension	2,183.98		4,040.00	
Equipment	5,826.05		6,683.00	
Miscellaneous	14,929.15		10,067.00	
Total		$158,207.82		$185,285.00
Balance on hand January 1, 1918		10,039.74		....

RECEIPTS

In 1917 a total of $101,723.31 was received from the supervisors. During 1916 the supervisors' appropriation was $60,771.83, and in 1918 the amount has been increased to $133,625. The public interest in the bureaus is indicated by the material increase in the amount of public funds made available. This increase in confidence is shown not only by supervisors' appropriations, but by memberships as well. In 1916 a total of $14,237 was received as membership fees, in 1917 the amount increased to $23,279.13, while in 1918 it is estimated that $38,286 will come from this source.

Another noticeable item is the receipts from advertising in the *Farm Bureau News*. In 1916 this item amounted to $2501.44, in 1917 to $6540.80, and in 1918 it is estimated that the advertising in the *News* will return $9276. The growth and strength of the bureaus is indicated by the comparison of the total receipts aside from Government and State funds. In 1916 the total receipts of the bureaus amounted to $112,638.03 and in 1917 to $168,247.56, while in 1918 it is estimated that the bureaus will have available $197,396 entirely from funds contributed within the counties.

EXPENSES

The expenses, of course, have increased correspondingly. A few main items might be pointed out. In 1917 the amount expended for salaries was $56,523.20, while in 1918 this is estimated at $69,139. The traveling expenses amounted to $10,139.10 in 1917 and are estimated at $12,970 for 1918, this being less than a $3000 increase to cover the increased cost in 11 additional bureaus. In 1917 the automobile budget amounted to $32,750.47, while in 1918 it is estimated at $37,027. This indicates that the bureaus are practicing economy in the operation of automobiles, as an item of $4000 is estimated to cover the operation of the cars in 11 additional counties.

In 1917 a total of $2183.98 was expended for extension work, while in 1918 the budget allows a total of $4040, the amount being nearly double with an increase of about one-fourth the number of counties. This indicates that there is a larger demand for extension work within the counties.

The bureaus are in excellent financial condition as shown by the summaries. In 1916 the bureaus ended the year with a balance of $5829.62, while on January 1, 1918, there was on hand a total of $6998.06, considering outstanding liabilities and assets. The actual cash in the hands of the bureaus on January 1, 1918, was $10,039.74. The 1918 budgets have been carefully prepared, and an allowance of $12,111 left to provide for expenses not anticipated at the time of the making of the budgets.

DETAILED FINANCIAL STATEMENT

An opportunity for comparison of the financial standing of the bureaus in the various counties is given by table 7. The outstanding liabilities and assets are shown in table 7, and the present worth, or actual balance, on hand on December 31, 1917, was $6998.06. In Rockland County

the appropriation from the board of supervisors was made to cover 1917 expenses, but thru some misunderstanding was not made available until the beginning of the year 1918. This made it necessary for the bureau to take out a loan of $1000 to cover current expenses.

TABLE 7. DETAILED FINANCIAL STATEMENT OF FARM BUREAU ASSOCIATION RECEIPTS AND EXPENSES AND PRESENT WORTH

County	Receipts	Expenses	Balance on January 1, 1917	Outstanding liabilities	Assets due	Actual net balance on December 31, 1917
Albany	$4,031.20	$4,093.84	$—204.62	$500.00	....	$—767.26
Allegany	2,797.03	2,527.43	—212.97	....	....	56.63
Broome	3,369.43	3,275.54	127.17	....	....	221.06
Cattaraugus	6,586.32	6,069.72	—460.55	....	....	56.05
Cayuga	2,748.08	2,796.11	63.01	....	....	14.98
Chautauqua	3,359.49	2,928.55	—213.83	....	....	217.11
Chemung	3,496.50	3,001.91	—108.19	....	....	386.40
Chenango	3,875.60	3,959.42	285.86	....	....	202.04
Clinton	2,344.47	2,344.34	—46.45	....	$150.00	103.68
Cortland	4,292.44	3,955.44	506.24	....	....	843.24
Delaware	5,101.54	5,312.98	359.24	....	....	147.80
Dutchess	2,349.00	2,462.85	151.36	....	....	37.51
Erie	10,585.44	9,569.27	470.08	....	....	1,486.25
Essex	2,108.24	2,086.67	14.61	....	....	36.18
Franklin	2,966.34	2,586.37	—324.81	....	....	55.16
Genesee	1,674.78	1,041.06	....	726.00	65.47	—26.81
Greene	1,294.00	1,058.00	....	....	....	236.00
Herkimer	4,394.04	4,018.94	730.53	500.00	....	—355.43
Jefferson	3,884.48	3,396.56	290.07	....	....	777.99
Madison	3,096.31	3,577.70	....	....	....	—481.39
Monroe	5,506.21	5,228.93	—237.35	....	178.70	39.93
Montgomery	1,551.80	2,572.07	1,251.21	....	....	230.94
Nassau	5,330.43	5,381.26	52.62	....	....	1.79
Niagara	4,658.57	4,480.10	59.35	....	....	237.82
Oneida	4,398.21	5,000.47	449.96	....	....	—152.30
Onondaga	7,601.60	7,786.04	1,020.01	....	....	835.57
Orange	6,920.00	6,490.18	1,091.16	....	....	1,520.98
Orleans	3,848.53	3,497.17	....	....	....	351.36
Oswego	2,542.43	2,537.15	18.51	....	....	23.79
Otsego	5,861.16	6,124.36	558.22	....	....	295.02
Rensselaer	2,582.07	2,126.86	....	....	....	455.21
Rockland	2,157.00	1,685.98	....	1,000.00	....	—528.98
St. Lawrence	2,648.24	2,833.63	7.22	....	....	—178.17
Saratoga	1,417.75	2,558.05	1,198.38	....	....	58.08
Schoharie	3,068.66	3,095.81	225.89	127.74	....	71.00
Suffolk	3,405.90	2,880.42	....	....	....	525.48
Sullivan	2,610.25	2,539.39	28.23	....	....	99.09
Tioga	3,442.09	3,446.80	—9.89	....	34.50	19.90
Tompkins	3,600.26	3,056.42	—130.25	....	....	413.59
Ulster	3,018.84	2,763.01	—55.70	....	....	200.13
Warren	2,816.86	2,704.01	10.00	....	....	122.85
Wayne	3,615.89	3,625.56	....	....	....	—9.67
Westchester	2,732.00	2,827.42	224.91	....	....	129.49
Wyoming	2,728.46	2,904.03	101.45	1,587.66	971.00	—690.78
Total	$162,417.94	$158,207.82	$5,829.62	$1,399.67	$4,441.40	$6,998.06

EXPENSES OF THIRTY-NINE FULL-YEAR COUNTIES

The expenses met by farm bureau associations are shown in table 8. The State and Federal financial cooperation is shown in table 9.

Thirty-nine counties completed the full calendar year of 1917. The average county budget outside of Government funds amounted to $3868.24 during 1917. The average receipts in these thirty-nine counties are shown in table 8.

TABLE 8. AVERAGE EXPENSES AND RECEIPTS DURING 1917 FROM THIRTY-NINE FULL-YEAR COUNTY RECORDS

EXPENSES	Total		Average	
Salaries				
Agent	$26,259.71		$673.33	
Assistant	5,228.02		134.05	
Stenographer	20,199.90		517.95	
Labor	2,565.28		65.77	
Total		$54,252.91		$1,391.10
Travel				
Agent	$5,870.84		$150.53	
Assistant	1,998.18		51.24	
Executive committee	1,904.90		48.84	
Total		$9,773.92		$250.61
Automobile				
New car or sinking fund	$11,296.72		$289.66	
Gasoline and oil	6,139.30		157.42	
Tires	5,289.88		135.63	
Repairs	4,468.46		114.58	
Miscellaneous	3,022.19		77.49	
Total		$30,216.55		$774.78
Office				
Rent	$2,347.49		$60.19	
Freight and express	229.58		5.89	
Telephone and telegrams	4,767.09		122.23	
Stationery	2,847.24		73.01	
Postage	3,099.28		79.46	
Miscellaneous	3,615.82		92.72	
Total		$16,906.50		$433.50
Printing *News*	$12,697.95		$325.59	
Other printing	3,989.79		102.30	
Extension service	1,973.41		50.60	
Scientific equipment	1,301.53		33.37	
Office furnishings	3,962.49		101.60	
Miscellaneous	13,723.70		351.89	
Total		$148,798.75		$965.35
Balance unexpended		$7,892.43		$202.37
Average county budget				$3,868.24
RECEIPTS				
Balance on January 1	$5,829.62			
Board of supervisors	96,574.53		$2,476.27	
Memberships	20,480.73		525.13	
Donations from all sources	11,281.94		289.28	
Advertising in *News*	6,382.30		163.65	
Miscellaneous	16,142.66		413.91	
Total		$156,691.18		$3,868.24

PRINCIPAL SOURCES OF SUPPORT OF FARM BUREAUS IN NEW YORK STATE

The moneys from the Federal and State governments are paid directly to the agents as salary and do not go thru the hands of the treasurers of

the farm bureau associations. These funds are appropriated on the basis of the fiscal year, July 1 to June 30, and are reported on this basis in table 9.

TABLE 9. PRINCIPAL SOURCES OF SUPPORT OF FARM BUREAUS IN FIFTY-FIVE COUNTIES IN NEW YORK STATE

Source	1917		1918	
			Estimated	
	Total	Rate of distribution per county	Total	Rate of distribution per county
‡United States Department of Agriculture	$19,800.00	$600.00	$21,600.00	$1,200.00 (18 counties)
‡New York State Department of Agriculture	26,400.00	600.00	33,600.00	600.00 (55 counties)
‡Federal Smith-Lever	6,600.00	600.00	9,900.00	600.00 (16 counties)
‡War emergency	41,556.00	*944.45	*63,210.00	1,149.00
County boards of supervisors	101,723.31	2,311.89	134,625.00	2,443.00
Memberships	23,279.13	529.07	38,286.00	696.00
Chambers of commerce	2,100.95	47.74	1,180.00	236.00 (5 counties)
Private and corporated contributions	10,339.43	235.00	6,218.00	345.00 (18 counties)
Advertising in *News*	6,540.80	148.65	9,276.00	171.00 (54 counties)
Balance on hand	5,829.62	....	6,998.00	127.00
Miscellaneous	†18,424.32	418.73	1,813.00	33.00
Total	$262,593.56	....	$326,706.00	....

* Money paid as part salaries of agents and assistants.
† This item includes short-time loans taken out to cover current expenses.
‡ These funds are appropriated on the basis of the fiscal year July 1, 1917, to June 30, 1918, and are paid directly to agents as salaries.

Membership dues are contributing $38,000 to the county budgets, which is an increase of about $10,000 over last year. Private contributions are, on the other hand, somewhat smaller. In 1917 they amounted to $10,339.43, while in 1918 the estimated amount is $6218. This indicates in no way a lack of confidence on the part of individuals or business concerns, but tends to show that the bureaus are obtaining greater confidence on the part of public officials and are also more largely supported by membership dues.

The returns from advertising in the *News* for 1918 are estimated at $9276, or an average rate of $171 a county. The average cost of publishing the *News* is $325.59, thus the cost of getting out this paper is more than half met by the returns from advertising. In a few cases the entire cost of the paper is met in this way.

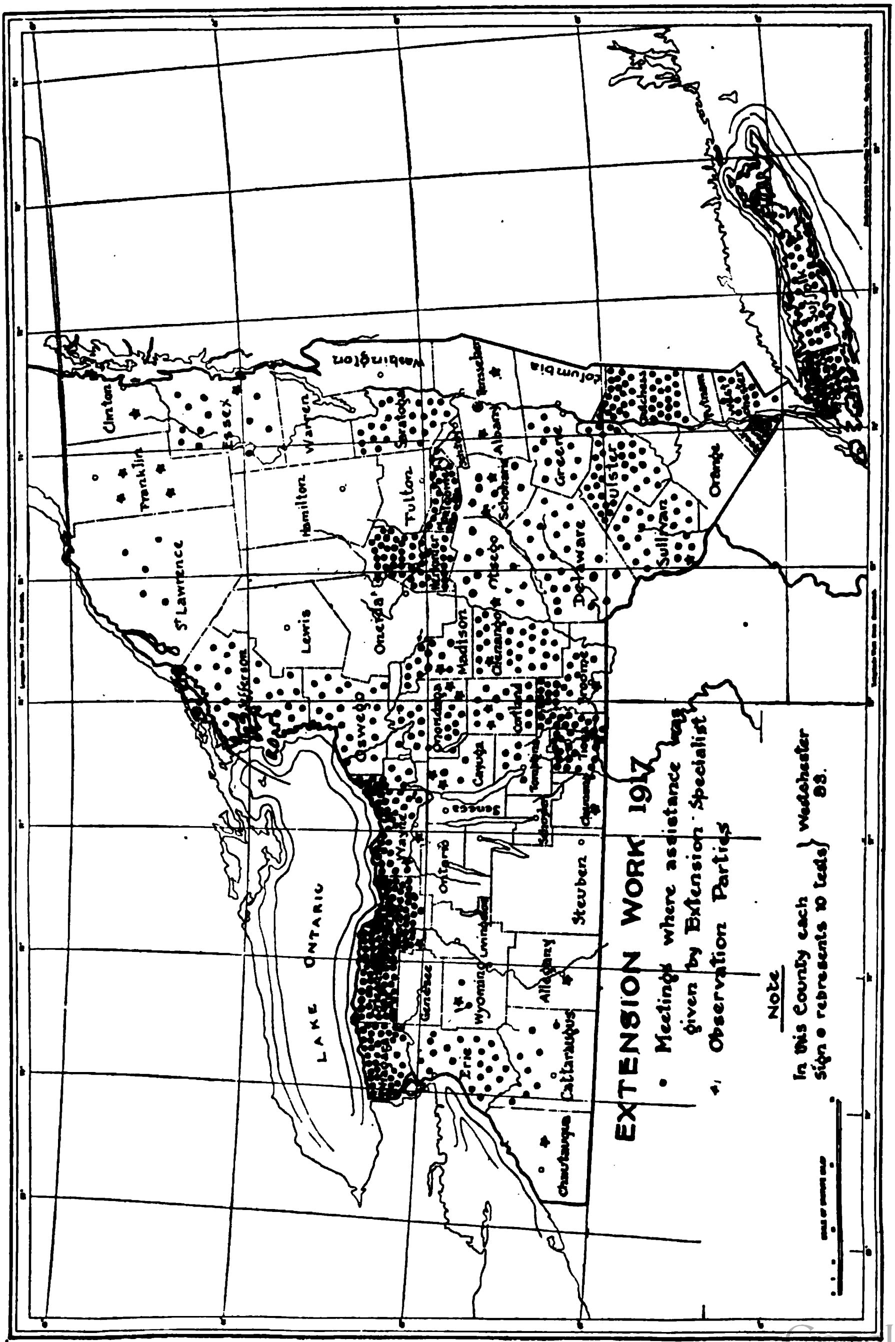


FIG. 1. MEETINGS AND FIELD TRIPS IN WHICH EXTENSION SPECIALISTS ASSISTED FARM BUREAUS

ACTIVITIES OF COUNTY AGENTS

Data showing how the agents reached the farmers in their counties in farm visits, office calls, and various kinds of meetings, are given in table 10.

Last year the average number of farm visits per county was 326, while this year the average per county is 641. This increase is primarily due to two reasons: first, that many of the agents made special efforts to keep in close touch with the farmers in order to be of every possible service to them, and, second, that assistants were working in many of the counties, the farm visits made by them being included in this report. These figures prove that the volume of the work has increased not only in the office but in the field as well.

In comparing the number of office calls made at the headquarters of the agent during 1916 with those made during 1917, it will be noted that there has been a remarkable increase. In 1916 the average number of office calls was 361, while in 1917 there were 1249. This increase is largely due to the fact that farmers were so eager to assist in the national crisis by increasing crops that they availed themselves of every opportunity to get the necessary information. Hundreds of farmers who had not before taken interest in farm bureau work made personal calls on the county agricultural agents or made inquiries of them by telephone. It is probable that there will be a permanent increase in the number of office calls.

The number of meetings held and the attendance also increased. In 1916 the average number of meetings was 92 per county with an average attendance of 49.5, while in 1917 the average number of meetings is 97 with an average attendance of 57. The number of meetings and field demonstrations has decreased as well as the attendance. It was the general feeling among the farmers thruout the State that they did not have time to attend field demonstrations this year, primarily because of the serious shortage of labor.

The farm bureaus cooperated with the granges and the dairymen's leagues in holding a great many meetings, as shown by table 10. Farm bureaus are public service organizations and as such are always ready to assist other agricultural agencies in every way which they can in accordance with the scope of farm bureau work.

COUNTY FARM BUREAU EXHIBITS AT THE STATE FAIR

The State Fair Commission inaugurated the plan of having county farm bureau associations exhibit at the fair. Ten prizes of two hundred and fifty dollars each were given for the ten best exhibits. The awards were made on the basis of 40 per cent credit for quality and variety of products displayed, 40 per cent for accuracy in representing the agriculture of the county, and 20 per cent for educational features.

Thirteen counties exhibited: Cayuga, Chautauqua, Chenango, Clinton, Cortland, Dutchess, Jefferson, Madison, Nassau, Onondaga, Orange, Tompkins, Wayne. The competition was keen. Cortland County won the first, Orange County the second, and Cayuga County the third prize. The interest taken showed decidedly that the work and the money expended in preparing the exhibits had been well directed. The county exhibits proved to be one of the features of the fair.

TABLE 10. ACTIVITIES OF COUNTY AGENTS

County	Farm visits	Office calls	Farm bureau meetings		Grange meetings		Dairymen's league meetings		Demonstration meetings		Miscellaneous meetings		Total meetings	
			Number	Attendance	Number	Attendance	Number	Attendance	Number	Attendance	Number	Attendance	Number	Attendance
Albany	251	1,705	30	871	10	706	12	339	32	502	17	1,102	101	3,520
Allegany	527	1,021	39	1,717	11	866	11	505	12	145	19	1,527	92	4,760
Broome	963	1,854	49	1,782	8	367	8	401	42	677	25	1,323	132	4,550
Cattaraugus	468	1,116	40	1,200	5	446	7	2,315	39	413	15	909	106	5,283
Cayuga	344	1,862	17	717	19	1,854	......	......	39	825	15	2,419	90	5,815
Chautauqua	330	1,154	36	2,214	5	186	15	757	38	641	25	1,156	119	4,954
Chemung	624	1,065	19	451	5	265	23	792	31	512	18	1,157	96	3,177
Chenango	981	1,622	28	1,390	16	788	14	1,012	43	1,706	68	3,973	169	8,869
Clinton	638	639	13	771	4	241	......	......	36	492	17	692	70	2,196
Cortland	352	2,217	27	1,954	10	468	14	723	21	560	42	12,026	114	15,731
Delaware	1,032	1,285	43	2,138	2	325	5	553	45	797	53	4,028	148	7,841
Dutchess	164	1,685	23	1,113	9	382	2	104	12	395	30	1,894	76	3,888
Erie	1,179	2,092	*	*	*	*	*	*	*	*	*	*	*	*
Essex	433	301	23	1,046	11	614	5	287	36	306	25	1,513	100	3,766
Franklin	346	1,575	21	1,290	12	479	11	589	4	45	23	1,657	71	4,060
Genesee	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Greene	118	140	5	179	......	......	......	......	10	146	3	962	18	1,287
Herkimer	557	2,237	81	2,995	18	1,377	10	799	15	247	59	5,775	183	11,193
Jefferson	220	1,002	35	1,892	5	1,095	12	624	35	431	27	1,705	114	5,747
Madison	792	769	31	883	5	525	4	175	49	3,054	17	794	106	5,431
Monroe	1,325	1,130	12	716	8	563	3	307	51	1,761	41	4,909	115	8,256
Montgomery	518	996	28	2,690	16	596	6	242	12	399	50	3,088	112	7,015
Nassau	1,344	2,743	29	3,036	2	71	......	......	9	1,341	21	2,951	61	7,399
Niagara	417	1,521	21	909	5	722	15	490	14	1,232	70	6,261	125	9,614
Oneida	1,089	1,647	*	*	*	*	*	*	*	*	*	*	*	*
Onondaga	920	2,871	29	1,791	11	710	4	230	25	541	23	1,460	92	4,732
Orange	1,947	2,168	16	1,029	31	2,209	4	455	53	1,141	74	5,680	178	10,514
Orleans	523	781	6	1,251	1	30	1	20	33	715	13	1,327	54	3,343
Oswego	1,503	1,262	26	1,125	2	298	2	192	37	743	28	1,818	95	4,176
Otsego	875	913	55	1,900	5	236	6	398	52	4,897	20	1,736	138	9,167
Rensselaer	397	748	10	898	......	......	14	1,054	8	114	6	343	38	2,409
Rockland	175	284	2	550	......	......	......	......	6	106	21	250	29	906
St. Lawrence	384	680	14	1,037	13	764	4	346	15	204	35	2,017	81	4,368
Saratoga	165	242	27	955	4	229	7	132	22	311	8	646	68	2,273
Schoharie	836	1,135	20	682	2	135	6	241	24	713	54	2,364	106	4,135
Suffolk	524	648	2	65	10	665	......	......	20	319	7	525	39	1,574
Sullivan	390	637	25	1,504	19	887	15	521	45	892	22	1,111	126	4,915
Tioga	498	1,819	32	1,794	3	97	3	64	18	253	40	1,445	96	3,653
Tompkins	464	1,592	26	1,683	5	408	6	474	21	394	36	2,251	94	5,210
Ulster	666	1,834	44	1,815	2	125	......	......	21	1,793	34	1,600	101	5,333
Warren	324	257	32	1,147	2	220	......	......	25	846	29	1,199	88	3,412
Wayne	693	850	24	1,779	5	352	2	121	36	3,381	5	405	72	6,038
Westchester	486	808	12	532	4	576	......	......	11	940	51	6,854	78	8,902
Wyoming	802	804	32	1,965	9	619	23	994	1	100	47	3,608	112	7,286
Total	27,584	53,711	1,084	55,456	314	21,496	274	16,256	1,098	35,030	1,233	98,460	4,003	226,698
Average per county	641	1,249	26	1,352	8	565	8	508	26	854	30	2,401	97	5,529
Number of counties reporting	43	43	41	41	38	38	32	32	41	41	41	41	41	41

FIG. 2. ORANGE COUNTY EXHIBIT AT THE STATE FAIR, 1917

PROJECT AND FIELD WORK

Organization and methods of project and field work remained very much the same as in other years. On account of war emergency the amount of regular project and field work has necessarily decreased during 1917. Not all of the 1917 work had been definitely planned at the time war was declared, and many plans that were made had to be changed immediately to meet emergency conditions. The farm bureau associations and their agents had very short notice to shift the entire year's project to meet special conditions. The amount of work was not decreased, but effort was shifted to new lines in which the volume of work nearly if not quite doubled.

I. FARM MANAGEMENT DEMONSTRATIONS

The farm management demonstration work was carried on this year in 25 counties, mainly thru two lines of work: first, the taking and returning of farm records, and second, starting farm accounts. A total of 298 farmers were helped to start farm accounts. Farmers realize more than ever the value of keeping careful accounts. This is due largely to emergency conditions whereby the prices of various commodities are being fixed on the cost of production. Farmers are beginning to appreciate the value of knowing how much it costs to produce their products.

Ninety-seven farm records were taken in 6 counties by the farm bureau managers, and 371 records were returned in 7 counties.

The following extracts from Oswego and Niagara County reports show progress made in farm management work in these counties:

This was the second year of farm management work in Oswego County. Farm Management Demonstrator C. P. Clark, of the College of Agriculture, spent a few days here and assisted personally in returning 90 of the previous year's records to farmers and in taking new ones. The record for the year was returned on a suitable blank along with the general average of all the records taken. Farmers could then see which of their farm practices, if any, did not pay well the previous year. Twenty-five of these men were sufficiently interested to give a record for 1916. These records will be tabulated and returned next spring. After two years it is expected that the men will be sufficiently acquainted with the method followed to do the work unaided.

In Niagara County 86 farmers cooperated in recording the business done on their farms during 1916. This is the fourth year that such records have been taken in the township of Newfane, and the results are being worked up by the Department of Farm Management at the State College of Agriculture in order to determine if possible those factors which make for success in farming where fruit is the main product sold. As a result of this work 10 farmers started bookkeeping, a practice in which farmers are deficient and which would be of value at the present time in helping to determine prices on farm products.

II. LIVESTOCK

The work done with the livestock industry has had to do particularly with (1) dairy improvement associations, (2) livestock breeders' associations, and (3) sheep breeders' or woolgrowers' associations. Perhaps the greatest activity during the year has been shown in the growth of interest in the sheep industry, which is accounted for in part by the increase in the price of mutton and wool. All work done has been in cooperation with the animal husbandry specialists of the State College of Agriculture.

DAIRY IMPROVEMENT ASSOCIATIONS

The dairy improvement association work this year has made progress in spite of various difficulties. One of the definite improvements made has been the working out of an agreement between the various parties concerned, which has strengthened the work. The difficulty in carrying on this work this year has been the shortage of qualified testers, due to the low wages paid to testers in accordance with what other men of equal training are receiving and the drafting of a large number of them for military service. In a few cases the farmers have been willing to raise the wages of the tester to $2.50 a day and maintenance. However many farmers have felt that this was too much, and in some instances it has been impossible to organize associations on this account. During the past year 14,160 cows were under test in 19 active dairy improvement associations. From these various herds 506 cows were discarded on account of low production. Individual owners at the suggestion of the various county agents also tested 4993 cows.

A good example of the difficulties under which the dairy improvement association work has been conducted this year and the progress made is shown in the following extract taken from the annual report of the Delaware County farm bureau:

During the last year very great interest has been shown in dairy improvement associations because farmers are beginning to realize the value of this work. Four more associations have been organized, and one or two associations could be completed

with very little work. Because of the scarcity of labor it is very difficult to keep competent testers. Eight associations have been the most that have been operated, but now only five have testers.

The work has done much to build up some of our best dairies and is looked upon with favor by the most progressive dairymen of Delaware County. A great many of the herd record books have been summarized in the farm bureau office.

LIVESTOCK BREEDERS' ASSOCIATIONS

Four cattle breeders' associations have been formed in Oneida, Onondaga, Schoharie, and Sullivan Counties during this year. These associations have been the means of (1) bringing breeders in closer contact with one another, (2) stimulating the interest in livestock in these counties, and (3) promoting better market conditions by extensive advertising.

A good example of the results of this work is taken from the Otsego County report:

The annual meeting of the Holstein Club was held on January 18, 1917, at Richfield Springs. Officers were elected, and a lively discussion of club programs was a feature of the meeting. The club membership has increased from 46 in 1916 to 84 in 1917. The summer picnic was held, as planned at the winter meeting. Seventy automobiles brought 450 persons to Harwick Seminary. There were no speeches. The Burlington Flats band rendered excellent music. The herds of Lee Kinne and Henry Swarthout were inspected. A committee appointed for the purpose secured the consignment of 13 animals for sale at the picnic. These animals were sold by R. V. Kelly for $2117.50. The club netted $400 for its treasury. A column of advertising was purchased in the *Farm Bureau News* at a cost for the year of $42.50. Club stationery has been used by members during the year. Seventy-eight animals were shown at the State Fair as part of the collective exhibit of the farm bureau.

WOOLGROWERS' ASSOCIATIONS

Due to present conditions there has been great interest in the sheep industry in New York State. This is accounted for in part by the increased prices paid for mutton and wool. Two breeders' associations have been formed for the sale of wool and lambs. Two years ago Otsego County set the example, and since that time Essex, Warren, Saratoga, and Washington Counties have formed associations.

A good example of the results of this work is shown by the following extract from the Warren County report:

A sheep breeders' association was organized early in the winter. Much of the credit of this organization is due to J. B. Brown. The sheepmen have held a wool sale which has resulted in higher prices for their wool. The wool was sold on November 5 for 70 cents a pound flat. Without the association most of the wool would have been sold early in the season to the numerous buyers for from 40 to 65 cents a pound, according to the time it was sold. Estimates furnished by the members show at least 12,000 pounds of wool. This cooperative sale saved for the farmers of the county at least $1200, estimating the advance at 10 cents a pound.

Warren County farmers are keeping all their ewe lambs that are fit for breeding. This should give us nearly 50 per cent more sheep next year. The census taken last spring shows that there were 6484 breeding ewes on 441 farms in the county. No cooperative effort has been made to purchase rams, but this will probably be the next development.

III. SOIL IMPROVEMENT

LIME

Most of the work under soil improvement has had to do with demonstrations with lime, fertilizers, and drainage. A standard system of demonstration was not followed in all counties. Since the soil varies widely in

the several counties it may not be always possible to follow a state-wide uniform plan, but it is desirable that a more uniform and comprehensive plan should be followed by the various county agents. Cooperating with the Department of Soil Technology of the State College it is expected that some such plan of soil improvement work will be developed.

FIG. 3. RESULTS OF THE USE OF LIME IN OSWEGO COUNTY

The use of the Truog soil testing outfit has enabled many of the county agents to measure acidity of the soils on 491 farms in 25 counties during the past year. Eight counties reported holding 176 field demonstrations in connection with the use of lime. Twenty counties reported that a total of 91,389 tons of lime had been purchased and used during 1917. Some excellent work has been done in several counties during the past year in recording the results of the use of different quantities of carbonate of lime (table 11).

TABLE 11. INCREASED HAY PRODUCTION DUE TO LIME

County	Number of demonstrations	Form of lime	Amount of lime used per acre	Yield of hay per acre (pounds)		
				Limed	No lime	Increase of dry hay per acre
Chenango	3	....	1,000	5,275	3,912	1,363
Chautauqua	5	Carbonate	2,000	2,081	1,201	880
Chemung	10	Carbonate	2,000	4,495	2,671	1,824
Chautauqua	1	Carbonate	2,400	1,523	1,320	203
Broome	5	Carbonate	2,440	5,622	4,243	1,379
Chenango	3	Carbonate	4,000	4,690	3,151	1,539
Oswego	9	Carbonate	4,000	3,900	1,940	1,960

The following extract is taken from the Tioga County report:

Altho the use of lime is becoming quite general over the entire county and excellent results are being obtained, farm bureau committeemen at their conference last winter generally pointed out the need of more work along this line. Field tests should be arranged for practically every community in the county. During the winter only 48 cooperators were secured to carry on these tests. On account of an unfavorable season probably quite a number of these tests will not mature. An especial effort has been made to place these tests along the highways, and just so far as possible signs will be erected on these plots during the spring of 1918. The differences in yield on the limed and unlimed plots will be obtained from as large a number of plots as time will permit. The results from the use of lime are being constantly pointed out at farm bureau meetings, and the bureau has been instrumental in greatly increasing the use of lime in the county. Prices of the different kinds of lime are kept on file at the farm bureau office.

FERTILIZERS

Previous to last year most of the work done in connection with fertilizers consisted of advice to individuals or groups of farmers. Last year some work was done showing the value of acid phosphate in comparison with other fertilizers and as a supplement to farm manure. This work was continued in 1917.

On recommendation of the agents, 497 farmers in 22 counties used 3035 tons of chemical fertilizers; last year 569 farmers in 17 counties used 2132 tons. These figures indicate that farmers are using chemicals and making up their own fertilizers to a great extent.

The use of acid phosphate is becoming more prevalent, and on the recommendation of the county agents 962 farmers in 15 counties used it to reinforce manure.

The following extract is from the Cortland County report:

Cooperators were secured by personal interviews. Farmers desiring to cooperate furnished the necessary amount of acid phosphate for the test. For this work as many fields as possible were selected along the public highway. After a farmer had plowed and harrowed the field on which his cabbage was to be planted, a representative of the farm bureau measured off the test plots and applied the different amounts of acid phosphate. The arrangement and general plan of all these test plots were the same, and they were selected in a portion of the field where the soil conditions seemed to be most uniform. The cabbages on these plots were set in the same way and given the same care and cultivation as the balance of the field.

At harvesting time representatives from the farm bureau and a representative from the Department of Vegetable Gardening of the State College of Agriculture visited the plots. All the necessary equipment for cutting and weighing the yield of the test plots was supplied by the farm bureau. The owners of the fields and their neighbors assisted in the work of cutting and weighing the cabbage. The results proved to be most interesting and instructive to these farmers. A larger application of acid phosphate than 750 pounds did not pay. From 500 to 750 pounds returned a good profit, but larger applications were not profitable under average conditions.

DRAINAGE

Drainage work has continued along the same general lines as in previous years with renewed interest in some sections due to the introduction of tractor ditchers. These were placed mainly thru the State Food Supply Commission. In Tompkins County arrangements were made for a farmer to purchase one of these machines and operate it for custom trade.

Twenty-five counties report a total of 120 farms on which preliminary definite drainage systems have been laid out, this work being done by

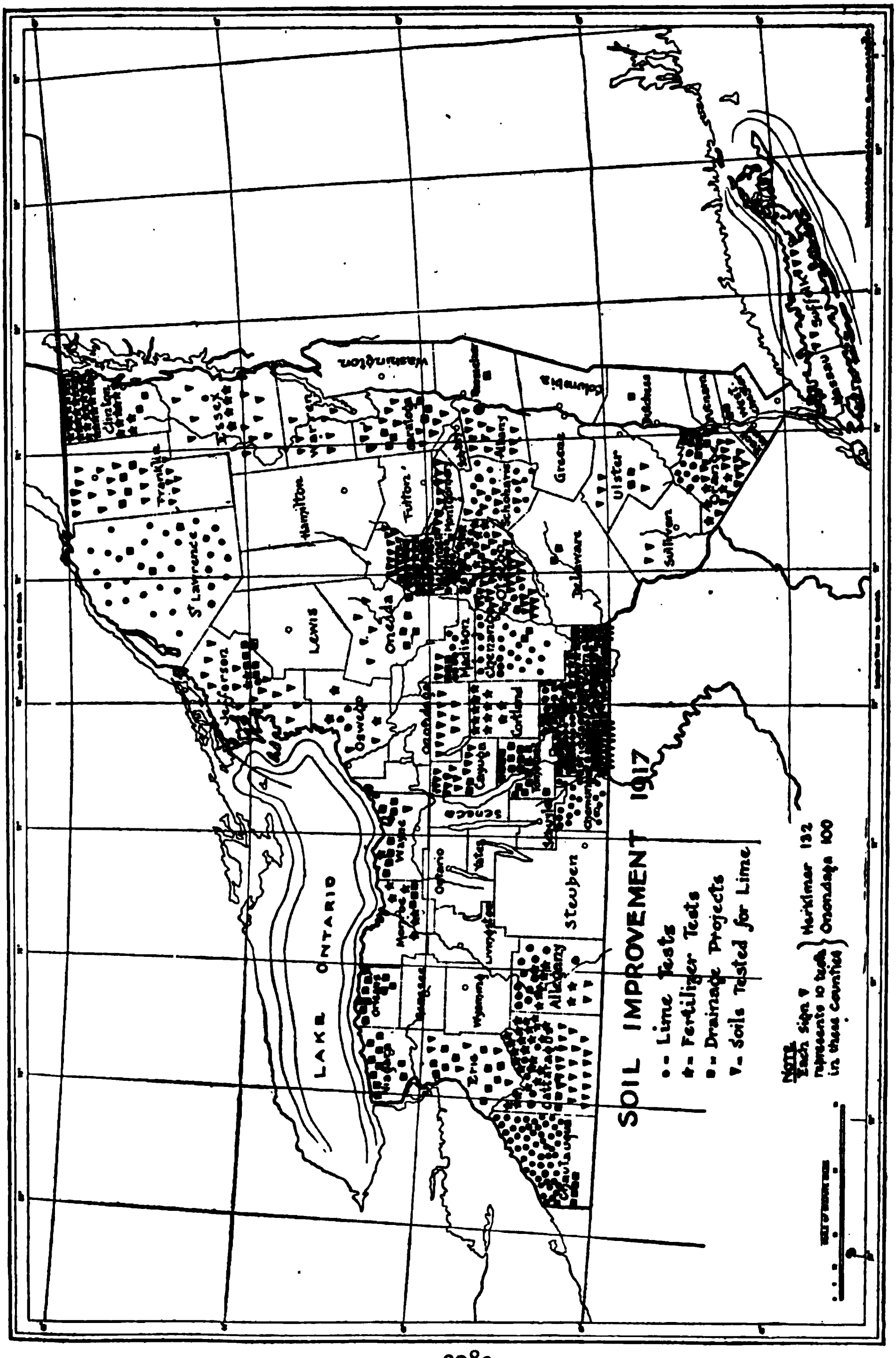


FIG. 4. DISTRIBUTION OF SOIL IMPROVEMENT WORK DURING 1917

the drainage specialists of the Departments of Rural Engineering and Soil Technology of the College of Agriculture. The aggregate area covered by these systems exceeds 2524 acres.

A committee representing the farm bureaus, the Departments of Rural Engineering and Soil Technology of the State College of Agriculture, and the New York State Conservation Commission, is studying the drainage laws of the State with a view to recommending changes to obviate the present troubles relative to obtaining drainage outlets across neighboring properties. The simplification of the present necessary legal procedure will greatly encourage and stimulate the drainage of small wet areas.

FIG. 5. OBTAINING DRAINAGE LEVELS IN TOMPKINS COUNTY

Good examples of drainage work are quoted from the Tompkins and Orleans County reports in the order named.

By far the most important work in the field was again on drainage. The demonstration work of last year aroused interest in this work to the extent that a machine has been purchased in the western part of our county, and has been at work since June first with very satisfactory progress. This machine has required the attention of the bureau in making field surveys, keeping the cooperative backing of the farmers, and other items.

A machine was rented from the New York State Food Supply Commission to take care of the large demand created in other portions of the county. This machine was delivered late and worked under very bad weather conditions during all the time. However, the association has been well pleased with the progress and expects to make provision to continue its rental. The machine dug since the latter part of September 1141.7 rods of trench on 8 different farms and will just about break even on expenses and receipts.

By guaranteeing a large roddage of ditch to be dug, Orleans County succeeded in getting one of the three power ditchers owned by the State. This $3500 machine has opened 137 rods of ditch in a single day. Since September first it has worked on

7 farms and put in 2022 rods, or nearly 6⅓ miles, of tile. Approximately 410 acres have been drained. The two letters received from the men for whom we have ditched will give an idea of what they think of the work done by the machine.

"I have your favor of November 10 with reference to the ditcher which was used on my farm. The machine worked very satisfactorily and the results where I ditched are beyond my expectations. I think this machine should be left in the county as there is so much land in need of drainage and the results have been so very satisfactory that I consider it a great asset to the county." (Signed) Carl H. Breed

"Replying to your favor of the tenth in regard to the work done on my farm this year with the power ditcher, am pleased to say the work done for me was entirely satisfactory and believe the work was done much better and cheaper than it could have been done by hand labor.

"I think if more ditching could be done it would be a great help to the county."

(Signed) C. H. Pettis

IV. CROP IMPROVEMENT

Crop improvement has continued to be an important project among the various county farm bureaus. A vast amount of work is yet to be accomplished, particularly in regard to the standardization of varieties of the various crops grown in the State. In this work the bureaus are cooperating closely with the Departments of Farm Crops and Plant Breeding of the State College.

CORN IMPROVEMENT

Variety tests with silage corn were undertaken in 25 counties largely following the plans of previous years. In this work 486 tests were planted, but owing to the exceedingly unfavorable weather conditions many of the tests were destroyed or failed to properly mature to supply the desired information. Seventy-two field meetings were held in connection with this project, with a total attendance of 982 persons.

As already stated, weather conditions were so unfavorable that the accumulation of a large amount of comparable data for 1917 was not possible. The experience of previous years has pointed favorably toward the advisability of recommending early or semi-early maturing varieties when growing silage in New York. Considerable variations in climate and soil in the State render it improbable, however, that one variety of corn can be generally recommended except for local sections. The best variety or varieties for the various sections have not yet been determined, but much satisfaction has been expressed with Luce's Favorite. The kind of data desirable to obtain from these variety tests, if the results from the different counties are to be compared, is illustrated in tables 12 and 13.

Much valuable work in growing seed corn has been started in Suffolk County on Long Island. The variety grown is Luce's Favorite, an eight-rowed semi-dent type that has given and is giving excellent satisfaction for silage in other parts of the State. The development of this source of seed corn is being fostered by the Suffolk County farm bureau in cooperation with the Department of Farm Crops of the State College.

During the past year 62 different fields were inspected by the county agent and a representative from the Department of Farm Crops, for the purpose of ascertaining whether the corn was true to type and of good quality. From these first inspections 52 seed corn growers have organized a seed corn growers' association. It is estimated that 20,000 bushels of seed corn of this variety will be grown, and handled thru this association.

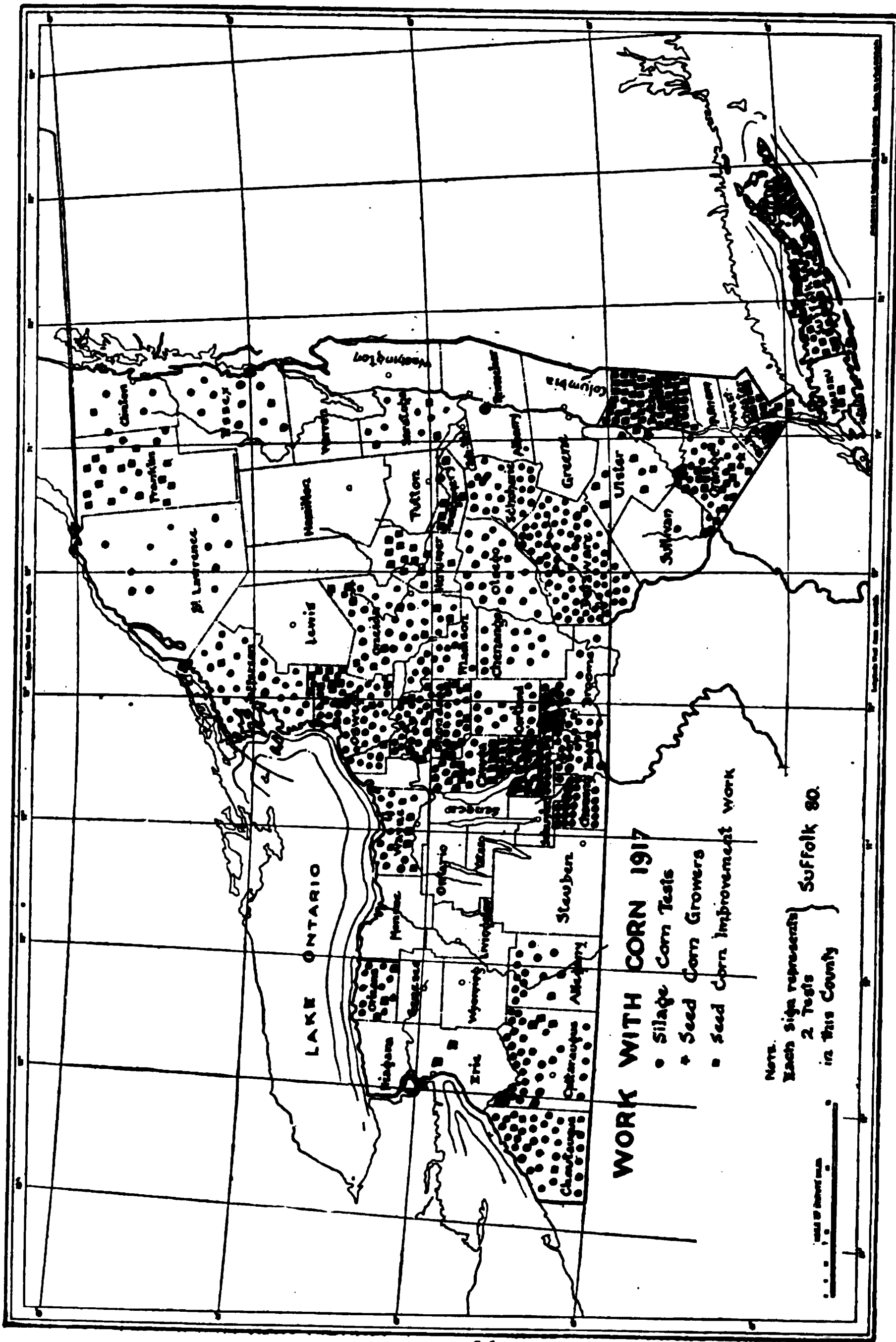


FIG. 6. DISTRIBUTION OF CORN IMPROVEMENT WORK IN 1917
This is a major project with the farm bureaus

TABLE 12. AVERAGE RESULTS OF TEN VARIETAL TESTS OF SILAGE CORN IN JEFFERSON COUNTY FOR 1917*

Name of variety	Green weight per acre (tons)	Dry matter per acre (tons)	Estimated yield of dry grain per acre (bushels)
Golden Glow	11.9	3.6	51.2
Angel of Midnight	9.0	2.9	50.5
White Cap Dent	11.7	3.0	40.4
Gold Nugget	12.0	3.2	37.2
Bailey Dent	11.5	2.9	34.9
Wisconsin No. 7	12.1	3.0	33.5
Luce's Favorite	13.5	3.2	27.1
Eureka	12.8	3.0	20.1
Minnesota King	9.9	2.5	18.0
Sanford Flint	12.1	3.1	18.1
Leaming	14.6	2.9	9.0

* The average period of growth in Jefferson County was 110 days.

TABLE 13. AVERAGE RESULTS OF NINETEEN VARIETAL TESTS OF SILAGE CORN IN ORANGE COUNTY FOR 1917

Name of variety	Green weight per acre (tons)	Dry matter per acre (tons)	Estimated yield of dry grain per acre (bushels)
Hall's Gold Nugget	13.00	3.11	44.30
Cornell No. 12	13.70	2.76	43.40
Luce's Favorite	14.64	2.67	36.40
Jersey Dent	12.80	2.68	42.90
Leaming	13.50	2.70	31.80
Eureka	15.54	2.76	32.50

OAT IMPROVEMENT

In 1916 a vigorous and effective campaign was carried on for the control of oat smut, under the leadership of the Department of Plant Pathology of the College of Agriculture. Upwards of 100,000 acres were planted with treated seed. This year the work was of a follow-up nature, treatment campaigns being run in only a few counties where the work had not previously been done. The bulk of the work with smut control was done in Chenango, Herkimer, Madison, and Oneida Counties. An extract from the Madison County report follows:

Thirty-one demonstrations for treating seed oats for smut were conducted in the county with a total attendance of 567 persons. Three hundred and nineteen farmers signed cards to the effect that they would treat their seed. The amount of this seed is sufficient to sow 3054 acres. From the information gained by the circulation of the questionnaires to these farmers it is very evident that the value of this work was far-reaching and permanent.

Another important phase of the oat improvement work was begun this year, but was confined in the main to Jefferson and St. Lawrence Counties. Oats are by far the most extensively grown grain in the State, but very little work has been done to improve or to standardize this crop except by the Department of Plant Breeding at the State College of Agriculture. A number of so-called varieties of oats are to be found growing in any community. Questions arise as to which of these many varieties are the best for the locality or the section and what improvement can be made in yield. The following examples of the work being done in this connection are taken from the Jefferson County annual report:

Ninety per cent of the grain crop of the county consists of oats. There has been a great diversity of varieties and kinds grown. The plan of this project is to acquaint the farmers with the fact that there is great confusion in the matter of names of the different varieties of oats and that it is desirable that the best variety be found and a drive made on this chosen variety.

Other variety tests conducted on 6 farms show marked differences in yields. The work needs to be continued for at least another year before deciding on any one best variety. Meanwhile seed improvement work is being conducted on the American Banner variety in cooperation with the Department of Plant Breeding of the State College of Agriculture. One or two strains that indicate unusual merit ought to be isolated from these varieties.

Results obtained from oat variety tests are given in table 14.

TABLE 14. REPORT OF OAT VARIETY TEST, CHAUMONT, JEFFERSON COUNTY, 1917

Variety	Yield per acre, J. I. Van Doren farm (bushels)	Yield per acre, J. D. Warner farm (bushels)	Yield per acre, Bert Walrath farm (bushels)	Average yield (bushels)
American Beauty	69.90	61.88	39.27	57.01
Dillenbeck	54.14	46.00	40.52	46.88
O. A. C. 73	54.29	56.00	62.53	57.60
American Banner	61.41	61.25	37.02	53.23
Native Oats	65.56	56.90	42.77	55.07
King Oat	45.64	51.25	36.52	44.47
Native Oat	63.73	60.25	48.27	57.41
Twentieth Century	60.33	66.63	45.52	57.49
Prolific	56.77	....	....	....
No. 4	61.36	55.88	49.87	55.70
Big Four	....	....	41.27	....

POTATO IMPROVEMENT

The potato improvement work done by county agents has consisted largely of spraying to control blight treatment for scab and other diseases, and seed selection by the hill tuber-unit method. In Clinton, Franklin, and Cayuga Counties seed potato growers' associations have been organized and are operating successfully. Considerable effort was given to emergency work in supplying seed and in spraying to control blight. A full statement of this is made in the emergency report (p. 50).

In 1917 there were 159 seed improvement tests in 20 counties, as compared with 182 tests in 18 counties last year. There were 84 meetings held with a total attendance of 1279 persons, as compared with 24 meetings in 1916 with an attendance of 435. Eleven thousand acres were planted with treated seed on 2850 farms as a result of the county agents' activities.

A considerable amount of work has been done looking toward a more extensive certification of seed true to variety and free from disease. In this the various bureaus have worked in close cooperation with the Department of Plant Pathology at the State College and the State Food Supply Commission. An example of this work is taken from the Clinton County annual report:

This phase of crop production has probably received more attention than any other. We believe that this is justified especially during the present crisis.

During the last season two seed treatment demonstrations were held.

FIG. 7. AN INCREASED YIELD OF ONE-FIFTH, AS A RESULT OF SELECTION AND SPRAYING

Over 30 fertilizer tests were put in to determine the relative value of acid phosphate as compared with the mixed fertilizer containing nitrogen, and also to determine the amount of each fertilizer to use to obtain the best results. This work has been carried on very carefully, and we believe that the results we have obtained fully justified the time spent. The experience this last season indicates as conclusively as one year's work can that we can safely dispense with the nitrogen part of fertilizer on the majority of potato fields here in the county. When we take into consideration the high cost of this particular ingredient this year, the value of this work is greatly emphasized.

During the fall months a thoroly organized campaign was put on to greatly increase the number of farmers in the county selecting high-quality seed potatoes for their next year's use. To bring this about 28 demonstrations were held with a total attendance of 342. Over 150 potato growers are this year selecting from the high-yielding, healthy hills either for a seed plot or for their entire requirements next spring. This should bring about a very marked influence upon the character of seed used in the potato districts this coming season. The fields that have been planted with this kind of seed in years previous have been excellent demonstrations of the value of selection. We anticipate that good returns will result from it.

The following extract is from the Franklin County report:

The Franklin County Potato Association is the outgrowth of a plan formulated by the bureau in cooperation with a number of successful potato growers to organize for

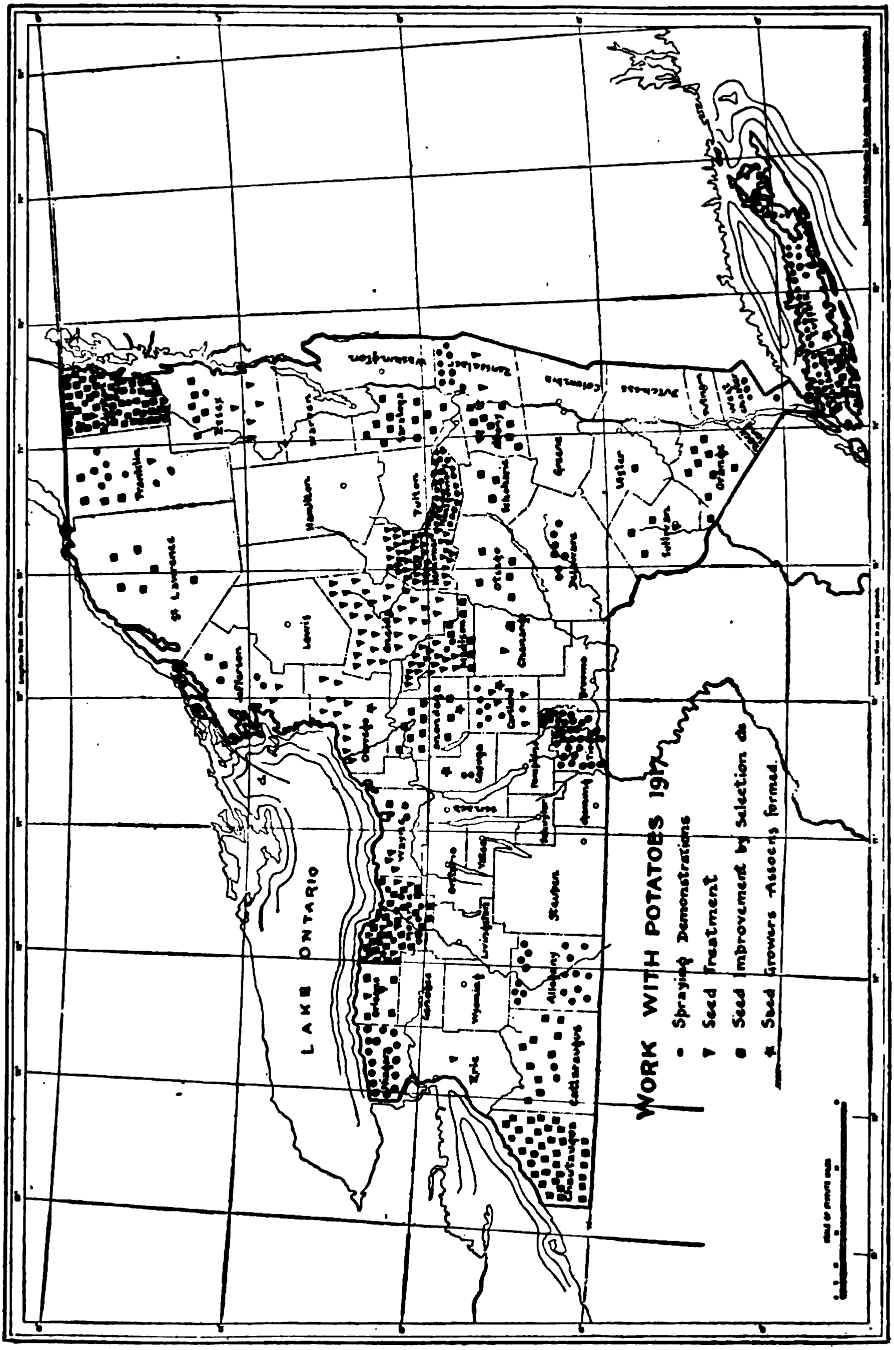


FIG. 8. DISTRIBUTION OF POTATO IMPROVEMENT DEMONSTRATIONS IN 1917

the purpose of producing a special grade of stock for seed purposes. In 1916 there was a membership of 21 growers, and the association was able to ship 6 carloads of certified seed to southern growers. The membership has grown this year to 28 members and has a likely output of about 25 cars of certified seed. The office has rendered timely assistance to the members of the association during all parts of the year.

Early in 1917 the association voted to send the agent to New Jersey in order to inspect some of the plantings grown from the 6 cars of seed sold in 1916. Many fields were examined while in bloom, and in every instance opportunity was afforded to contrast the growth of this stock with that of seed of local origin and some from other places. In every instance our seed showed a growth of foliage and a large setting of tubers not infrequently superior to those stands grown from native seed.

The early beginnings in the production of certified seed may be attributed to the service that the bureau has given in individual potato work, since which time the work has manifestly grown to a lucrative industry. The association this year will do a business amounting to about $35,000.

The interest in spraying potatoes is growing from year to year. Not all of the data on this project have been reported in shape to permit tabulation. Some of the results obtained by spraying during the past year are shown in table 15.

TABLE 15. RESULTS OF FIELD DEMONSTRATIONS IN SPRAYING POTATOES IN 1917

County	Number of demonstrations	Number of times sprayed	Yield per acre (bushels)		
			Sprayed	Not sprayed	Gain
Monroe	2	1	205.0	180.0	25.0
Monroe	3	2	191.6	162.5	29.1
Monroe	7	3	154.6	131.8	22.8
Monroe	5	4	170.0	136.0	34.0
Jefferson	1	4	242.0	183.2	58.8
Allegany	8	4	207.8	135.3	72.5
Cortland	6	5	207.3	107.0	100.3
Monroe	3	5	173.1	149.9	23.2
Oneida	3	6	261.0	150.1	110.9
Wayne	1	6	171.8	167.1	4.7

INTRODUCTION AND GROWTH OF LEGUMES

During the past season the bureaus, with the help of the Department of Farm Crops of the State College of Agriculture, have done a large amount of work with alfalfa, vetch, the clovers, and soybeans. Because of the high cost of grain there has been a special opportunity for the farm bureaus to advocate successfully the use of some legumes to improve roughage, especially in the dairy counties. Since much of the work has been in the nature of advice and suggestions to farmers it is difficult to give an adequate report of it. The continued use of lime in the acid soil counties is also helpful in increasing the introduction of legumes.

ALFALFA

The counties that have done the most work with alfalfa during the past year are Albany, Cattaraugus, Chautauqua, Delaware, Erie, Herkimer, Orange, and Tioga. In some counties the farm bureaus have advocated the

sowing of a few pounds of alfalfa seed with every grass seed mixture in order to get the alfalfa bacteria into the soil. The number of new alfalfa demonstrations started has been less this year than formerly. To illustrate some of the typical work being done with alfalfa in this State, quotations are given from the annual reports of Tioga, Cattaraugus, and Albany Counties, respectively:

The increasing cost of feeds has created a greater interest in the use of home-grown feeds and better roughage for dairy cattle. Several committeemen believe that we have considerable area of land in this county which is well adapted to alfalfa growing. The objects of this project are, first, to determine which soils and localities of this county are adapted to growing alfalfa, second, to determine the best farm practice in the establishment and handling of the crop, and, third, to determine the best types or varieties of alfalfa for this section.

Seventeen plots were started in communities where committeemen deemed it advisable. These plots are located along the highway and will be properly labeled during the coming season. In all these plots hardy seed from South Dakota was planted, and in 4 plots the Grimm variety will be tried out.

Only 6 new alfalfa fields were started this year, but results of previous work are being measured and seem to show a large need of more soil in such a state of fertility that alfalfa will thrive. Results so far have shown that much energy, time, and money are lost in endeavoring to grow alfalfa before soils are ready.

The bureau had planned to conduct as many alfalfa seed demonstrations as possible, and it had 35 demonstrations outlined. As a result of the emergency work but 19 demonstrations were carried thru successfully, but the present high price of feed and the interest aroused at these demonstrations make it possible to plan for a large number of demonstrations for another year.

SWEET CLOVER

Some miscellaneous work and a few demonstrations on sweet clover have been given in some counties. Several counties are doing pasture improvement demonstration work, and sweet clover has been used in most of these tests and seems to be a very desirable addition to the mixture.

The following extract is from the Albany County annual report:

From observation in this county I am convinced that sweet clover can be used for the improvement of our pastures and poor soils. Sweet clover will grow on a large number of farms without much effort on the part of farmers. With the use of lime it can be made to grow in other sections of the county. Some farmers are afraid of the plant because it runs wild. I have been trying to show these men the way to use sweet clover and have succeeded to some extent. For the steep lands bordering on the main streams of the county, I have suggested the seeding of sweet clover and alfalfa with a light seeding of bluegrass. The sweet clover and the alfalfa are to be made into hay for as many years as they will produce a good crop of hay; then the land is to be used as pasture.

WINTER VETCH

Experience with winter vetch during the past year has not been altogether encouraging. The crop cannot yet be considered suitable for New York, altho in certain sections of the State it has given excellent satisfaction. In other sections the farmers have not had altogether satisfactory experiences. The following extract taken from the Tioga County report is illustrative:

This crop was made the major project in 1916, and several plots were started. The work was not continued last year and therefore no new plots were established. Frank Hoyt, of Halsey Valley, reported a very satisfactory yield, but in general the work about the county has not been very encouraging.

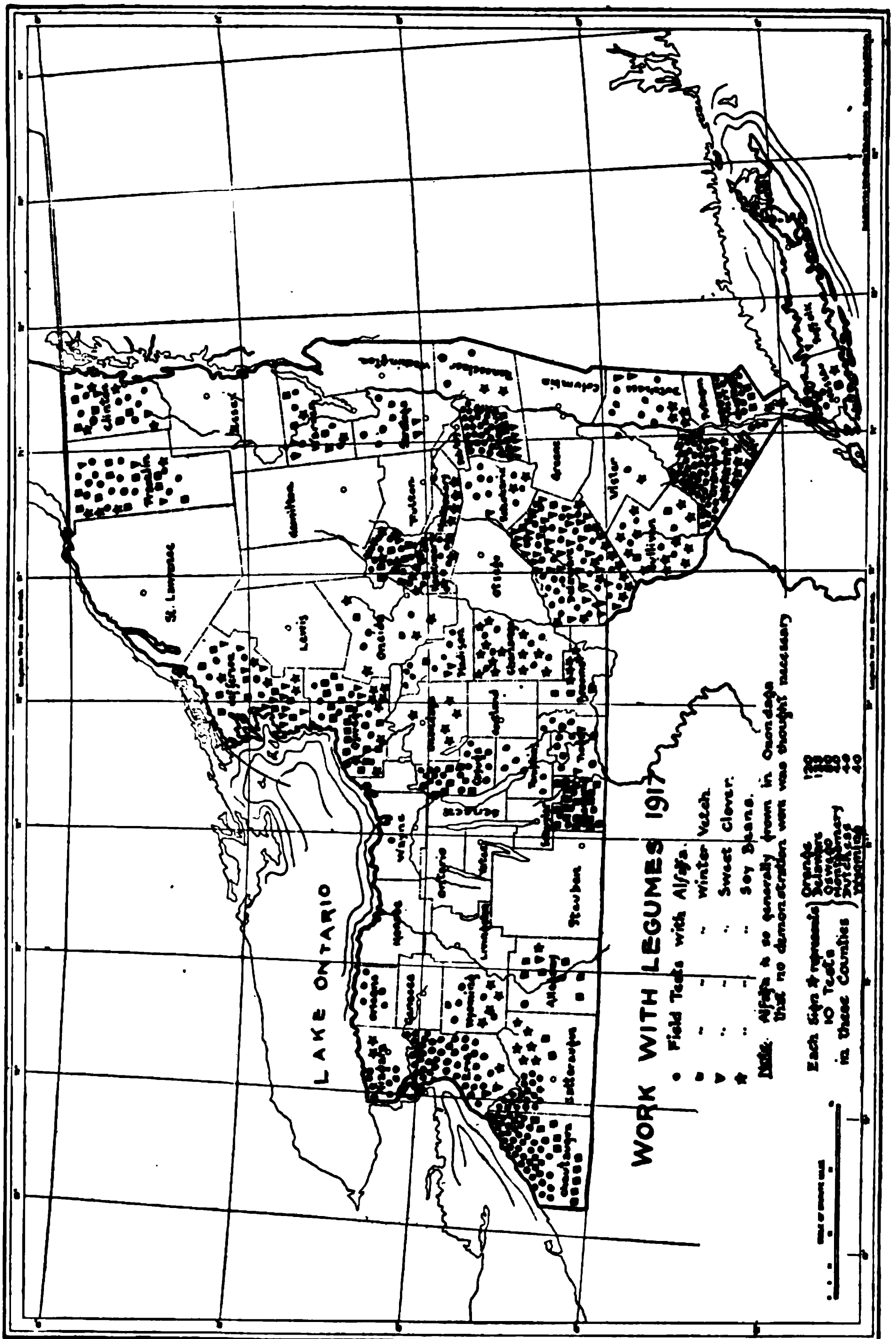


FIG. 9. DISTRIBUTION OF LEGUME TESTS IN 1917
More and better legumes are desired in all parts of the State

SOYBEANS

A few counties are making a major project of soybeans, growing them in ensilage corn. Without exception the counties that have tried out this project have reported satisfactory results. Soybeans seem to be a legume that should be grown in the dairy counties with silage corn to increase the amount of protein in the silage. The chief difficulty about combining the beans with the corn is in harvesting them. The Medium Green variety is most commonly grown.

The following extract taken from the Delaware County annual report illustrates the success with this crop:

The largest project undertaken by the bureau is with soybeans. In 1916, 28 tests of Medium Green variety did the best, being larger than Ito San, altho not so early. The Wilson variety was next, then Mongal, and last Mammoth Yellow, in degree of maturity.

V. ORCHARD IMPROVEMENT

The fruit-growing sections of New York State comprise areas just south of Lake Ontario in western New York, four or five counties along the Hudson in eastern New York, and a small area in Clinton County in northern New York. Apples and pears are the chief tree fruits in the eastern section; apples, pears, and peaches predominate in the western section. Ever since the organization of the farm bureaus in the fruit counties of the State, considerable work has been done in cooperation with the Departments of Plant Pathology, Entomology, and Pomology of the State College of Agriculture, in carrying on demonstrations showing methods of pruning, spraying, dusting, packing, and grading. At the request of farmers, orchards have also been inspected personally to point out diseases and insect troubles and methods for their control.

The farm bureaus have also done some work in the renovation of old orchards and in the better care of the good orchards now in existence. In 1916 orchard work was carried on in 22 counties, spraying and dusting demonstrations taking place on 95 farms with an attendance of 2064 persons. In 1917 there were 143 spraying demonstrations and 39 field meetings having a total attendance of 1022 farmers. Ninety-six pruning demonstrations with 90 meetings were held in 16 counties with a total attendance of 2094 farmers.

DUSTING VERSUS SPRAYING

The spraying demonstrations conducted during the past year in cooperation with the Departments of Plant Pathology and Entomology at the State College were chiefly for the control of apple scab and codling moth. In some of the older sections the control of San José scale received considerable attention. In the western New York apple section the comparative value of dusting and spraying was shown in 4 counties. The results of last year indicated that dusting was nearly as efficient as spraying, but cost a bit more. From present indications dusting may well supplement spraying on many of the larger fruit farms.

PEAR PSYLLA DEMONSTRATIONS

The farm bureaus did considerable work during the past year in the control of pear psylla, an insect that does considerable damage in the older pear sections of the State. This work consisted largely of inspecting orchards,

notifying farmers of the best time to spray and materials to use, and the like. The work in Oswego, Wayne, Monroe, and Orleans Counties was particularly successful. Reports indicate that lime and sulfur, 1 to 8, applied at the time the blossom buds separate, but before the orchard comes into bloom, are the most efficient.

PRUNING

Pruning demonstrations conducted in 16 counties with the help of the Department of Pomology at the College showed how to renovate old orchards and how to trim both young and bearing orchards. Interest in these demonstrations has always been very good, but as yet there has been no general method of pruning orchards in the western part of the State. In all these demonstrations fruit growers understand the under-

FIG. 10. A DISCUSSION AND DEMONSTRATION OF PRUNING METHODS IN OSWEGO COUNTY

lying principles and are generally agreed on most of the important methods. Generally these demonstrations are given by a specialist from the College of Agriculture or by some well-known successful fruit grower from a neighboring county. All kinds of fruit trees were pruned, and an opportunity was given for the farmers present to criticise and show their own methods.

FALL SPRAYING FOR PEACH LEAF CURL

The fall spraying of peach orchards for the control of peach leaf curl was first demonstrated in the State by the Monroe County farm bureau four years ago and has since been carried on in all of the western New York peach counties very successfully. Cooperating with the college pathologists a campaign was started in the western New York section last November urging peach growers to spray in the fall. Cold weather came on much earlier this year than usual, but reports indicate that many

orchards that have never been sprayed before in the fall had been sprayed fairly thoroly at that time. The results of the past year's demonstrations showed that fall spraying was just as efficient as spring spraying and had the advantage of being done when work was slack, the ground was hard, and the buds were dormant.

Spring spraying has always been uncertain and oftentimes unsuccessful because the ground has been so wet that farmers were unable to get into their orchards in time or they were in such a hurry that the trees were not sprayed thoroly. This work is of considerable importance.

PACKING, GRADING, AND MARKETING FRUIT

The packing, grading, and marketing of fruit has received considerable attention in the chief fruit-growing sections of the State. Since the enforcement of the amended apple-packing law, farm bureau men have been called on for assistance and sometimes for demonstrations of the best methods of grading and marketing.

LABOR AT HARVEST TIME

During the past season the bureaus were able to furnish men assistance in picking peaches. This was greatly appreciated by the growers, as the fruit ripened very quickly and had to be harvested in a much shorter period than usual. The apple crop was small, and the labor needed was not great. Niagara County working with the Car Service Commission helped the fruit counties materially in obtaining cars for the rapid transportation of the fruit. Most of the bureaus in the western New York section pointed out transportation difficulties to the Agricultural Department of the New York Central Railroad, which handles a large part of the peaches of western New York. The cooperation was appreciated, and better service was rendered to the growers and the shippers.

SPRAYING NEWS SERVICE

Niagara and Monroe County farm bureaus carried on information spraying service for the benefit of the apple, pear, and cherry growers during the past spring and summer, with the cooperation of the State Food Supply Commission. This was carried on in a modified form in a number of other fruit-growing counties of western New York and from present indications all the fruit-growing counties will want a similar service during the coming year. With the exception of Niagara County, assistance was rendered by a specialist furnished by the College of Agriculture or the State Food Supply Commission. In Niagara, L. F. Strickland, from the State Department of Agriculture, gave the necessary information for the fruit growers. An extract from the Niagara County farm bureau report is given here:

There was a general demand for more detailed information as to the exact time of spraying fruit trees. The growers wanted a system developed so that some expert, after viewing conditions in the county and taking into consideration the latest weather reports, could give immediate and accurate information as to when it would be well to spray. L. F. Strickland, inspector of the New York State Department of Agriculture, was the expert, and the United States Weather Bureau cooperated by telegraphing every night from Washington, in addition to sending special storm warnings by telephone from Buffalo and the weather maps each day by mail.

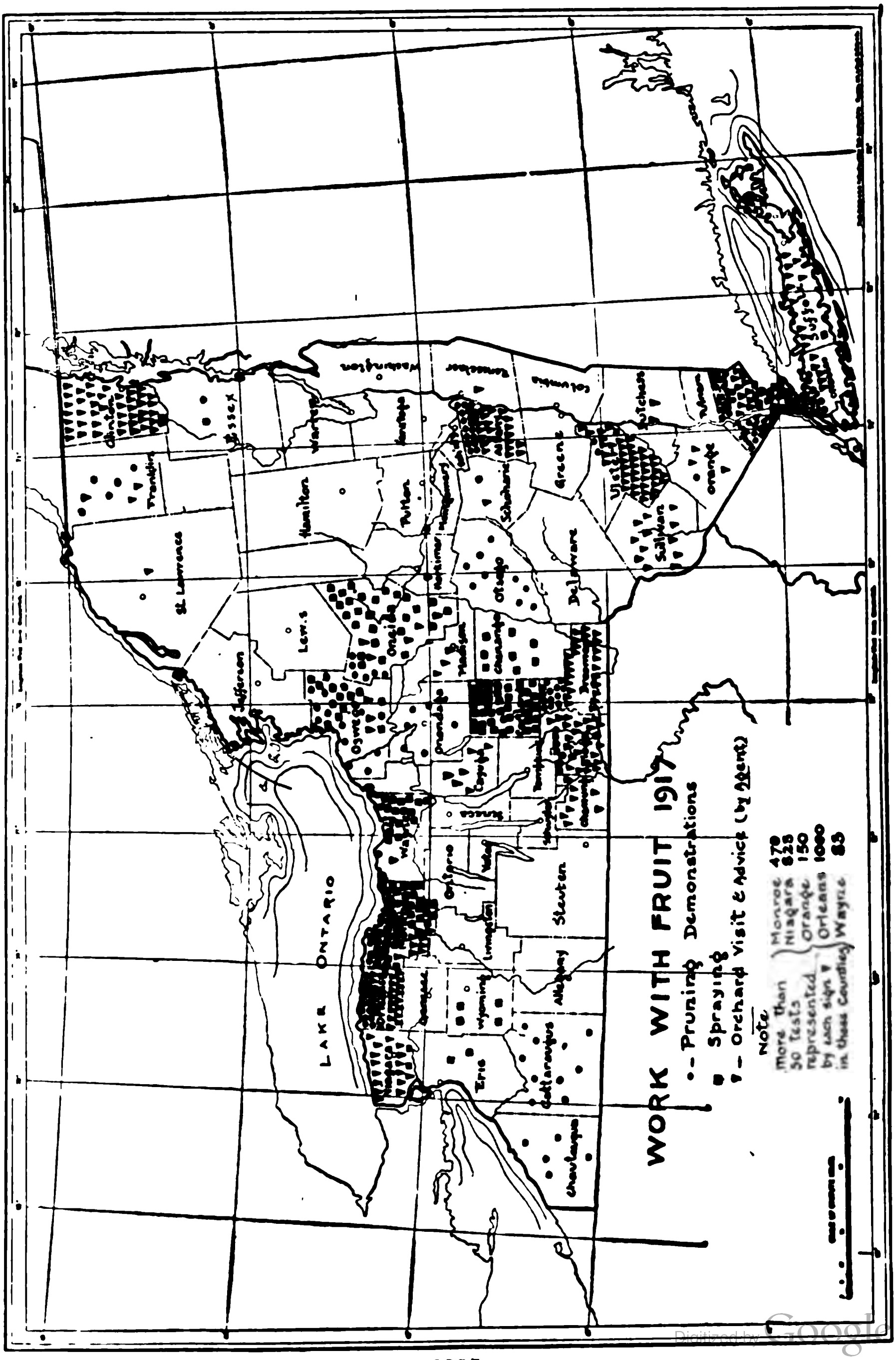


FIG. 11. DISTRIBUTION OF ORCHARD IMPROVEMENT WORK IN 1917

In order to spread such valuable warnings as rapidly as possible, a telephonic system was worked out. The information was sent to one man; he telephoned it to three; each of these three telephoned it to three; each of these nine to three, and so on, increasing in the ratio of 1, 3, 9, 27, 81, and 243. In this way 823 farmers, owning 9860 acres of orchard in Niagara County, received definite information the same evening it was available or before seven o'clock the following morning. Such a system has never before been developed to our knowledge anywhere in the United States, and it is indicative of the progressiveness of our Niagara County farmers that the system worked exceedingly well.

Altho the season was particularly unfavorable to fruit growing, the rainy weather at blossoming time having destroyed the possibilities of a crop to a large extent, still the control effected by this system was remarkable in many instances.

VI. POULTRY

The poultry work has consisted almost entirely of demonstrations in selecting hens for laying and breeding purposes. Poultry work was begun in earnest by the county agents in 1916, when a number of culling demonstrations were held in 16 counties. The results were so satisfactory that a big demand for this work was created and the project was taken up in many counties in 1917.

TABLE 16. POULTRY DEMONSTRATIONS

County	Number of demonstrations	Total attendance	Number of fowls culled
Albany	22	167	*
Allegany	8	83	5,500
Broome	11	215	16,860
Cattaraugus	5	71	*
Chemung	19	325	950
Chenango	14	478	20,000
Clinton	3	71	3,500
Cortland	2	65	200
Delaware	16	355	30,000
Dutchess	10	327	21,795
Erie	5	148	*
Essex	7	57	*
Greene	10	146	7,675
Monroe	6	196	*
Nassau	1	....	*
Orange	11	237	*
Orleans	11	242	6,941
Otsego	10	222	*
Saratoga	14	296	*
Suffolk	10	213	39,712
Sullivan	12	258	23,530
Tioga	7	117	*
Tompkins	5	43	650
Ulster	14	305	1,723
Warren	17	360	*
Wayne	76	1,009	24,279
Total	326	6,006	203,315
Number of counties reporting	26	25	15

* No report on number of fowls culled.

Last year poultry work was carried on in 26 counties, and much was accomplished thru cooperation of the county agents with the specialists of the Department of Poultry Husbandry of the State College of Agriculture. In 1917 there were 326 poultry demonstrations with a total attendance of 6006. In 15 counties 203,315 fowls were reported culled from flocks by farmers as a result of these demonstrations. Interest in poultry work has grown by leaps and bounds, and farmers are reporting that the demonstrations have been worth hundreds of dollars to them. Excellent examples of how the work is received and of the results obtained, are taken from the Delaware and Otsego County reports, respectively:

From August 6 to 10, L. M. Hurd, of the Department of Poultry Husbandry of the College of Agriculture, helped to conduct a series of 10 poultry demonstrations. Later Professor Brooks, of the State School at Delhi, aided with 6 more meetings, making a total of 16, which were quite fairly distributed over the county. About 30,000 hens were pledged to be culled. With feed at $60 a ton, the amount saved by selecting, as figured by the State College of Agriculture, would amount to $4398. The increased egg production next year due to selection, with eggs at 30 cents a dozen, would amount to $4475. This would give a total of $8873 saved if these 30,000 hens were properly culled. There are about 276,000 hens in Delaware County, which, if selected, would mean a saving to their owners of $82,152.

Poultry demonstrations conducted by L. M. Hurd were held in 10 communities. Two hundred and twenty-two persons, only 7 of whom were present at similar demonstrations last year, attended. Pledge cards were signed by 126 persons, who had 20,430 hens, agreeing to select out and sell the nonproducers. These 7 persons who attended the demonstrations before believed that the knowledge gained was worth $612 to them last year. A questionnaire was recently sent to each of the 222 persons and was filled out by 55. These men had 10,341 hens from which 4505 were culled. They believed that the information obtained was worth $1074 to them this year in the saving of grain alone.

VII. BOYS' AND GIRLS' WORK

The work with boys and girls in the State has been left in most counties to the school authorities. In almost all cases where farm bureaus have done much of this work it has been in cooperation with the district superintendents, the teachers, and Professor Griffin, who is in charge of this feature of rural educational work at the College of Agriculture. Several

FIG. 12. BOYS JUDGING STOCK AT THE FAIR

stock-judging contests have been held by the farm bureaus, and they have helped in garden projects, poultry projects, calf clubs, and the like. To illustrate more in detail the part that the farm bureaus have taken in work with boys and girls the following quotations are given from the annual reports of Nassau, Schoharie, and Chemung Counties, respectively, where the best of this work has been done.

Two hundred boys and girls cooperated in growing gardens and keeping poultry. A poultry project was run in cooperation with George Seifert, age fifteen, who started on February 1 with 15 Plymouth Rocks. From February 1 until July 1 these hens laid 1074 eggs, which sold for $46.03. They ate $13.95 worth of feed, leaving a profit of $32.08.

The object of the stock-judging contest was to make the boys interested in the greatest industry in Schoharie County. It was a continuation and enlargement of the work started in 1916. In order to instruct boys who had never used a dairy score card, the agent and Mr. Baker, of the Schoharie State School of Agriculture, gave demonstrations on local farms where all of the boys learned by observation and trial. Twenty-eight boys, coming from nearly every town in Schoharie County, took part in the work, and 16 of them won prizes. Twelve boys who were in the contest last year judged a ring of four Holstein cattle. Each boy placed the cows in the order of merit and then wrote his reasons for doing so. Liberal prizes were given to the winners.

The Chemung County Breeders' Association is cooperating with the farm bureau in a calf club project. The Second National Bank of Elmira supplied the necessary funds. There were 40 boys in the club. Next spring the heifers (two-year-olds) will be brought to a central point and sold at auction. The Hastings Company of Lacona will manage the sale. The object of this club was to interest the boys in good dairy animals and to teach them proper methods of management as well as business principles. The heifers for this club were purchased in one of the best Holstein regions of the State. This purebred stock will improve the dairy industry of the county as well as create added interest in better stock.

While most of the county agents of the State feel that the agricultural work with boys and girls belongs more to the schools than to the farm bureaus, yet there is a strong growing sentiment that the bureaus should do more work with the young people, should encourage the district superintendents and local authorities to take the initiative, and should then assist the school authorities in every way possible to carry thru projects with boys and girls. This sentiment is being fostered by Professor Griffin of the State College of Agriculture.

CONCLUSIONS

Farm bureau organization by community regardless of township boundaries seems to be eminently satisfactory, and there is every reason to believe that the plan is sound.

Counties with the higher percentage of membership are as a general rule accomplishing best results. A strong membership is, therefore, desirable in every county.

The county agent and the county organization should keep in mind a definite plan of work suited to the needs of the county. Emergency demands must be met, but permanent improvement can be attained only by following definite plans.

The accumulation of reliable evidence from field demonstrations and other lines of work depends on plans carefully made and conducted. Similar work conducted in adjoining counties can be compared only when uniform plans are agreed on and followed. It is desirable that most of this work should be conducted according to uniform plans recommended by the extension specialists of the various departments at the State College.

SUPPLEMENTARY REPORT OF WAR EMERGENCY WORK DURING 1917

When war was declared, there was a general feeling among leaders that the great mass of people did not realize the seriousness of the situation and the absolute necessity of raising a large acreage of crops. In order to bring this necessity to the attention of farmers, a special emergency conference of all of the county agents of the State and of the farm bureau presidents was called at Ithaca on April 16. Information on crop and food conditions was fully discussed. The conference decided to do two things thru the farm bureaus: first, to bring the seriousness of the situation to the attention of farmers at community meetings in each organized community in every farm bureau county of the State, believing that if the farmer realized the great need for a large food production he would do everything possible to fill that need; and, second, to immediately take an agricultural census in the State to determine just what the agricultural resources were and to obtain information as to what the farmers needed in order to help them to raise a larger amount of crops.

COMMUNITY MEETINGS

On returning to the counties the presidents of the farm bureau associations and the county agents began preparations to hold patriotic farmers' community meetings in every community. The date of these meetings was set by proclamation of the Governor for Saturday, April 21.

It was of course impossible for the agent to attend all these meetings, and the farm bureau organization was put to its greatest test in the conduct of them. In most cases the community committeemen were called to a county-wide meeting where the food situation was put before them and plans worked out whereby a committeeman would be responsible for the advertising and the conduct of the farmers' meeting in his own community. The response to these county-wide committeemen meetings was excellent, in many cases nearly every organized community being represented by several officers, and the way in which the committeemen assumed the responsibility of getting their neighbors aroused to the situation was inspiring.

The committeemen went home from the county-wide meetings and announced the community meeting to their neighbors by telephone, as there was little time for advertising by other methods. On April 21 all over the State were held hundreds of farmers' meetings entirely conducted by farmers for the purpose of mobilizing their resources and strength in the cause of liberty.

There were in all approximately 1089 community meetings held, with a total attendance of 85,075. In some counties from 65 to 75 per cent of the total farmer population in the county attended one of these meetings. The farm bureau community organization system had justified itself.

THE AGRICULTURAL CENSUS

At the same time that arrangements were being perfected for the patriotic community meetings, preparations were being made by the

county agents in every county to take an agricultural census. Thru the excellent cooperation of the New York State Department of Education, the census was taken by the aid of the district superintendents of schools, school-teachers, and pupils. Blanks were furnished by the New York State Food Supply Commission, which also paid most of the costs of the census, and were sent directly to the county agents. They met with the district superintendents of the county, and in some cases with the teachers, and instructed them in the methods of taking the census. They in turn met the teachers and gave them the instructions. The teachers, with the aid of a few of the older boys and girls, visited every farmer in their districts and obtained the desired information. School was closed while the census was being taken. After the information had been obtained from each farm, the teachers summarized the results on a special blank for their district and forwarded the original blank with the summary to the farm bureau office. As soon as the blanks were received, the farm bureau agent with the cooperation of local bank officials, district superintendents, State agricultural school-teachers, high school pupils, and others, summarized all the data for the county. The summaries for the county were then forwarded to the State College of Agriculture, where they were summarized for the State.

In many respects this was the most valuable and accurate census ever taken. What was also remarkable was that it was done so effectively in so short a time. In the majority of cases, in less than a week after the blanks had been received in the county, complete summarized returns were forwarded to the State College. Returns were had from nearly every school district in the State and from about 98 per cent of the farms.

HOW THE AGRICULTURAL CENSUS INFORMATION WAS USED

The census gave the State government correct information as to the agricultural resources of the State and what the immediate needs of the farmers were if crop production was to be increased. By knowing the needs of the farmers, the State authorities, thru the State Food Supply Commission and other agencies, were able to help them in the most efficient manner.

Perhaps the best use of the census data was made, however, locally by the farm bureau agent and his assistant, who acted as representative of the New York State Food Supply Commission. As soon as the census returns were forwarded, tabulated lists were made of all the seed for sale in the county, and these lists were sent to farmers whose names appeared on the census blanks as desiring to buy seed. For example, the census showed the farmers in the county who had seed potatoes for sale and also showed those farmers who wanted to buy seed potatoes. The names of those who had potatoes for sale were sent to those who wished to buy potatoes. This was done with all the common farm crops usually grown in the county. As a result many farmers were able to obtain the seed they wanted from neighbors who lived near them, but they did not have this information until they received the report from the farm bureau office. Tables showing the results and amounts of this service for some of the

leading crops are attached to this report. In cases where there was not enough local seed available, arrangements were made thru the New York State Food Supply Commission to ship in seed from outside sources, and in all cases farmers were sent lists of sources of seeds for different crops with prices.

The census also showed where cattle and horses were for sale and indicated those who wished to buy them. In many cases these lists were exchanged.

LABOR

The agricultural census showed that the greatest problem of increased production was that of obtaining sufficient labor, and the bureaus have devoted a large amount of time to helping farmers to obtain labor to raise and harvest their crops. A table showing the number of applications and

FIG. 13. DEMONSTRATING A TRACTOR IN HERKIMER COUNTY

the amount of labor furnished is attached to this report. Many different plans have been used to get farm help. In some cases manufacturers in cities and villages have released a few men for part time to help farmers during an emergency. The public schools released boys and girls in the spring to work on farms and gave them credit for their school work at the same time. Altho this privilege was abused, yet it probably did more to solve the labor problem than anything else. In several cases camps of boys and girls were established under leadership and did much to relieve conditions in a few localities. Many hundreds of city men were placed on farms, the farm bureau office acting as an employment agency. Altho a great many of these men were useless, yet from 50 to 60 per cent of them made fair help and aided in the relief of the labor situation. Most of this special labor work was handled by the emergency assistant county agent.

Altho labor has been a large problem during 1917, it is sure to be a larger one in 1918. Farmers are discouraged with the labor situation and unless

something is done so that they can obtain more labor, crop production for the coming year is likely to fall off.

TRACTORS AND DITCHERS

In order to increase the food supply, the New York State Food Supply Commission purchased 42 tractors. These were operated under the direction of the county farm bureau associations. Not so good results as were hoped for were obtained, but some progress was made and the total amount of acreage fitted by these tractors was considerable. Much of this acreage would not have been fitted without the tractors. Better results might have been obtained from the tractors if there had not been so much rain. Perhaps the most gain from the tractor work during the past season has been experience in determining the most successful types of tractors and the best methods of using them. This work will be continued on a larger scale another year, and some of this year's difficulties will be anticipated by holding, during the winter, tractor schools in different parts of the State to train farmers and others to operate tractors.

The power ditching machines purchased by the State have been operated by the farm bureaus during the past season. Each of these has been successful in its work. The 3 ditchers dug 12,000 rods of ditch, 3 feet deep. Not any of this would have been dug this year without the ditchers. The best result, however, from these machines is the cooperation brought about among farmers in handling the machines as community enterprises. As a result of the work of one of these machines in one county, 100 miles of ditching work was requested by farmers. More power ditchers will be operated in the same way during the coming season.

LIBERTY LOAN, RED CROSS, AND OTHER WAR ACTIVITIES

Farm bureau agents, because of their ability as speakers and their knowledge of rural conditions, have been called on freely to act on Liberty Loan and Red Cross committees and have assisted in interesting farmers to subscribe to the Liberty Loan and in the activities of the Red Cross and other war work.

CONCLUSIONS

The evidence shows that farm bureau agents, the farm bureau executive committees, and the local committeemen of this State have responded in every way possible to the war emergency work. They have not counted their hours of labor nor hesitated to sacrifice their personal interests to make the work count in the service of the government. Moreover, it is clear that infinitely more has been accomplished along all these lines because of the fairly complete and efficient farm bureau organization than would have been possible had this or a similar organization not existed.

TABLE 17. LABOR WORK OF COUNTY FARM BUREAUS, IN COOPERATION WITH THE STATE FOOD SUPPLY COMMISSION *

County	Applications received by agent for men and women	Applicants for work		Laborers supplied thru agent	
		Male	Female	Male	Female
Albany	171	30	......	149	....
Allegany	96	200	14	42	14
Broome	403	302	5	128	....
Cattaraugus	250	90	......	175	....
Cayuga	1,061	1,518	1,077	637	315
Chautauqua	....	250	5	304	6
Chemung	182	478	1	257	1
Chenango	275	47	6	120	5
Clinton	150	2	......	18	....
Columbia	58	9	......	72	....
Cortland	188	67	5	141	100
Delaware	58	11	......	41	....
Dutchess	650	575	......	500	25
Erie	....	450	......	310	....
Essex	16	3	1	5	....
Franklin	40	12	......	27	....
Fulton	33	13	......	23	....
Genesee	500	1,180	20	1,180	20
Greene	31	13	......	9	....
Herkimer	810	......	......	......	....
Jefferson	75	60	......	60	....
Lewis	46	3	......	20	....
Livingston	52	......	......	......	....
Madison	85	12	......	32	....
Monroe	....	......	......	3,799	....
Montgomery	94	9	......	85	....
Nassau	63	109	......	39	4
Niagara	3,450	......	......	1,558	....
Oneida	246	261	......	261	....
Onondaga	1,630	......	......	1,190	....
Ontario	114	39	......	31	....
Orange	....	......	......	360	....
Orleans	147	102	......	77	....
Oswego	85	42	......	50	....
Otsego	30	......	......	40	....
Putnam	11	1	......	8	....
Rensselaer	182	248	5	171	2
Rockland	....	......	3	18	1
St. Lawrence	49	3	1	13	1
Saratoga	35	7	......	26	....
Schenectady	14	12	......	9	....
Schoharie	62	2	1	44	1
Schuyler	49	16	......	13	....
Seneca	46	18	......	10	....
Steuben	38	25	......	7	....
Suffolk	124	20	......	146	....
Sullivan	64	30	6	22	2
Tioga	198	15	1	75	....
Tompkins	129	16	......	61	....

* Complete records of applicants were not available, and omissions indicate incomplete county reports.

TABLE 17 (*concluded*) *

County	Applications received by agent for men and women	Applicants for work		Laborers supplied thru agent	
		Male	Female	Male	Female
Ulster	230	64	12	105	10
Warren	13	5	....	5	....
Washington	106	64	....	49	....
Wayne	500	75	1	283	4
Westchester	54	181	....	15	....
Wyoming	300	30	....	30	....
Yates	116	56	....	34	....
Total	13,409	6,775	1,164	12,884	511

* Complete records of applicants were not available, and omissions indicate incomplete county reports.

TABLE 18. SEED CORN FURNISHED IN COOPERATION WITH THE STATE FOOD SUPPLY COMMISSION, AND RESULTS *

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Number of acres seeded as result of special campaign	Estimated yield of additional acres in bushels
Allegany	140	162	1,500	2,500
Broome	9	37	....	....
Cattaraugus	50	100	....	....
Cayuga	35	1,741	17,578	28,570
Chenango	240	500	1,200	36,000
Clinton	25	100	....	....
Columbia	....	5	....	....
Cortland	20	100	....	....
Delaware	1,360	582	2,759	....
Dutchess	100	500	....	....
Franklin	6	21	400	....
Fulton	....	5	....	....
Herkimer	14	51	150	....
Madison	50	1,000	2,250	175,000
Montgomery	45	150	600	....
Nassau	6	20	300	15,000
Niagara	1,700	2,941	....	....
Orange	200	250	1,600	64,000
Orleans	50	100	3,348	8,370
Oswego	25	35	75	750
Otsego	....	....	2,000	30,000
St. Lawrence	4	10	30	240
Saratoga	52	60	1,200	....
Schuyler	....	2	....	....

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

TABLE 18 (*concluded*) *

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Number of acres seeded as result of special campaign	Estimated yield of additional acres in bushels
Sullivan	....	....	35	....
Tioga	....	1,358	2,000	....
Tompkins	12	300	35	1,500
Ulster	44	500	300	2,400
Warren	121	160	....	....
Wayne	812	3,872	4,200	210,000
Westchester	12	30	100	4,000
Wyoming	4	15	....	....
Total	5,136	14,707	41,660	578,330

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

TABLE 19. SEED POTATOES FURNISHED IN COOPERATION WITH THE STATE FOOD SUPPLY COMMISSION, AND RESULTS *

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Acres seeded as result of special campaign	Estimated yield of additional acres in bushels*
Albany	264	2,230	247	24,700
Allegany	650	7,784	2,000	....
Broome	151	1,800	180	9,000
Cattaraugus	650	6,000	650	7,000
Cayuga	65	5,665	6,500	68,100
Chautauqua	800	4,800	400	....
Chenango	75	1,500	800	6,000
Clinton	50	2,000	1,500	2,000
Columbia	....	800	....	....
Cortland	290	4,387	1,500	70,000
Delaware	934	6,748	1,560	156,000
Dutchess	200	2,000	500	50,000
Essex	....	4,000	....	....
Franklin	....	2,030	1,500	220,000
Fulton	....	871	....	....
Herkimer	719	3,500	400	280,000
Jefferson	770	7,926	....	....
Lewis	....	4,800	....	....
Livingston	15	300	1,370	13,700
Madison	500	2,000	1,000	100,000
Monroe	125	3,000	....	....
Nassau	15	600	650	13,000
Niagara	1,500	12,500	1,300	78,000

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

TABLE 19 (*concluded*)*

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Acres seeded as result of special campaign	Estimated yield of additional acres in bushels
Ontario	....	600	....	....
Orange	1,099	10,525	1,552	126,240
Orleans	25	760	508	30,480
Oswego	175	2,063	135	11,475
Otsego	164	2,264	2,500	125,000
Rensselaer	82	1,900	230	2,300
St. Lawrence	265	1,303	100	9,000
Saratoga	130	750	2,200	198,000
Schuyler	....	21	....	....
Steuben	....	7,534	....	....
Suffolk	20	300	3,100	700,000
Sullivan	250	5,000	300	30,000
Tioga	287	2,300	300	3,000
Tompkins	45	2,800	265	12,000
Ulster	367	2,740	150	2,500
Warren	1,399	1,507	1,500	9,000
Washington	....	35	....	....
Wayne	461	2,400	1,800	180,000
Westchester	135	2,800	150	9,000
Wyoming	105	7,000	370	....
Total	12,782	141,843	37,217	2,545,495

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

TABLE 20. SEED BEANS FURNISHED IN COOPERATION WITH THE STATE FOOD SUPPLY COMMISSION, AND RESULTS *

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Acres seeded as result of special campaign	Estimated yield of additional acres in bushels
Allegany	400	435	500	5,000
Broome	8	15	25	300
Cattaraugus	15	50	....	....
Cayuga	20	648	3,500	5,520
Chautauqua	40	50	....	....
Chenango	125	150	300	3,500
Clinton	125	500	100	2,000
Columbia	....	10	....	....
Cortland	10	25	....	....
Delaware	415	245	381	....
Dutchess	12	100	100	1,000
Franklin	10	43	2,000	40,000

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

TABLE 20 (*concluded*)*

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Acres seeded as result of special campaign	Estimated yield of additional acres in bushels
Fulton	....	1	....	....
Herkimer	31	9	12	140
Livingston	12	200	4,000	22,000
Madison	50	100	250	2,500
Monroe	60	300	....	....
Nassau	25	1,000	200	2,500
Niagara	300	1,801	900	....
Orange	20	40	30	320
Orleans	100	350	748	2,992
Oswego	15	50	50	750
Otsego	49	51	400	3,200
Rensselaer	.4	28	30	350
St. Lawrence	40	25	30	450
Saratoga	80	240	480	4,800
Schuyler	....	18	....	....
Steuben	....	28	....	....
Suffolk	25	50	200	4,000
Sullivan	3	5	....	....
Tioga	112	283	400	....
Tompkins	24	950	420	730
Ulster	93	174	150	900
Warren	190	60	120	2,400
Washington	....	3	....	....
Wayne	275	2,570	2,400	12,000
Westchester	4	6	12	96
Wyoming	....	3,000	....	....
Yates	....	10	....	....
Total	2,692	13,623	17,738	117,448

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

TABLE 21. SEED BUCKWHEAT FURNISHED IN COOPERATION WITH THE STATE FOOD SUPPLY COMMISSION, AND RESULTS *

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Acres seeded as result of special campaign	Estimated yield of additional acres in bushels
Albany	24	192	192	2,880
Allegany	250	451	....	....
Broome	11	60	55	825
Cattaraugus	100	800	4,000	2,000
Cayuga	30	1,944	13,466	....

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

TABLE 21 (*concluded*)*

County	Number farmers assisted in obtaining seed	Number bushels seed obtained or located	Acres seeded as result of special campaign	Estimated yield of additional acres in bushels
Chautauqua	....	2,850	2,280	950
Chemung	28	300	....	....
Chenango	130	400	550	10,000
Clinton	75	250	125	1,500
Columbia	....	312	....	....
Cortland	260	100	....	....
Delaware	2,872	2,300	3,308	49,620
Dutchess	30	200	250	3,000
Franklin	5	24	....	....
Fulton	....	78	....	....
Greene	....	8,036	....	....
Herkimer	22	125	150	900
Jefferson	30	105	....	....
Livingston	5	25	....	....
Madison	300	20,000	2,000	40,000
Monroe	12	50	....	....
Nassau	4	40	45	675
Niagara	200	380	....	....
Ontario	....	600	....	....
Orange	21	357	616	12,380
Orleans	10	100	420	8,400
Oswego	125	200	300	7,500
Otsego	35	116	1,157	11,000
Rensselaer	18	137	64	1,600
Rockland	30	150	50	750
St. Lawrence	16	91	80	1,600
Saratoga	35	260	500	7,500
Schenectady	....	2,500	....	....
Schoharie	1	6	....	....
Schuyler	....	283	....	....
Steuben	....	1,047	....	....
Suffolk	12	25	30	600
Sullivan	20	20	100	....
Tioga	367	3,151	4,000	....
Tompkins	55	2,300	250	5,000
Ulster	270	1,500	1,200	30,000
Warren	60	300	....	....
Washington	....	55	....	....
Wayne	75	780	900	27,000
Westchester	6	22	12	600
Wyoming	25	20	25	....
Yates	....	834	....	....
Total	5,569	53,876	36,155	226,280

* Due to incomplete records, agents reported acres seeded but not estimated yield of additional acres in bushels, making totals inaccurate.

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